February 18, 1957 50 cents

AVIATION WEEK

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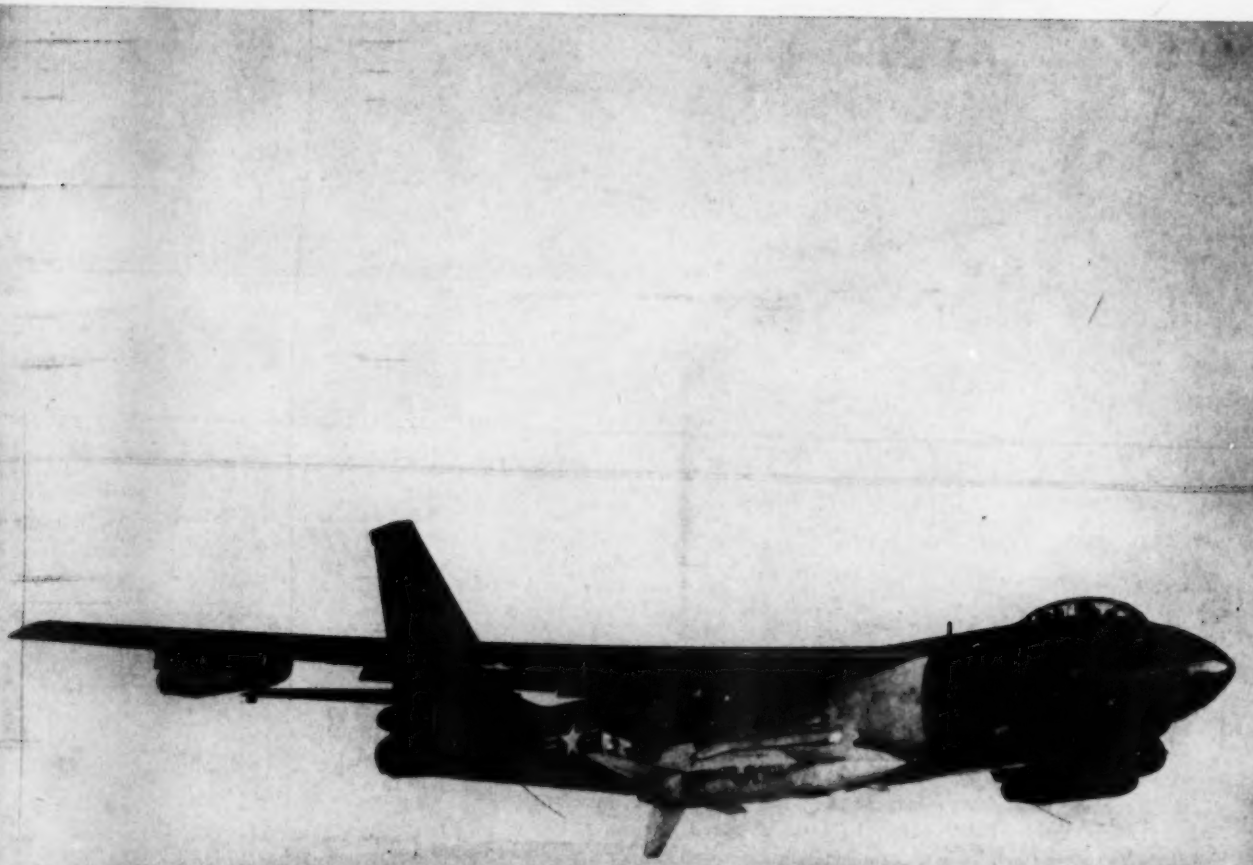
Perkins Details Budget Problems

•

Single Sideband Has High Frequency Lead



Bell Rascal on B-47

E B POWER GS
UNIVERSITY MICROFILM IN
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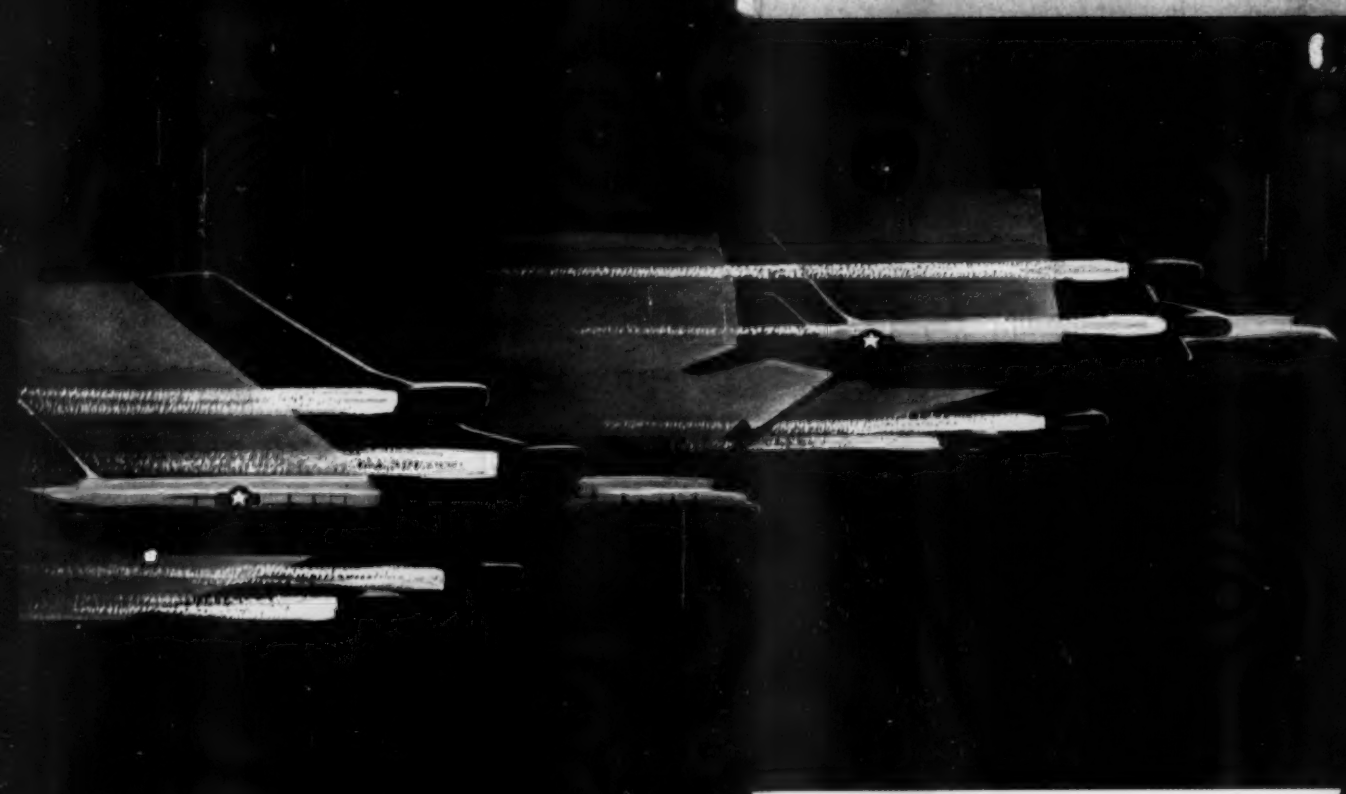

HIGH LEVEL DELIVERY

You're looking at a big forward step in American air power. The Boeing KC-135 jet tanker-transport shown refueling a B-52 goes *up* and *after* the supersonic bomber to deliver a fuel load. No longer will the B-52 have to *come down* and *slow down* to get its fuel. This means faster, safer, more efficient refueling and longer range operation for the B-52.

Foote Bros. has provided, and is providing for these aircraft, important Precision Assemblies for surface control mechanisms, as well as Precision Aircraft Quality Gears for the engines that power them.

We are proud of the confidence placed in us by the aviation industry, and prouder still of the performance of Foote Bros. components in these and other aircraft.

For design, development, and/or production of Precision Aircraft Engine Type Gearing, actuators and power transmission, come to Foote Bros. first. It will pay you dividends.

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Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION

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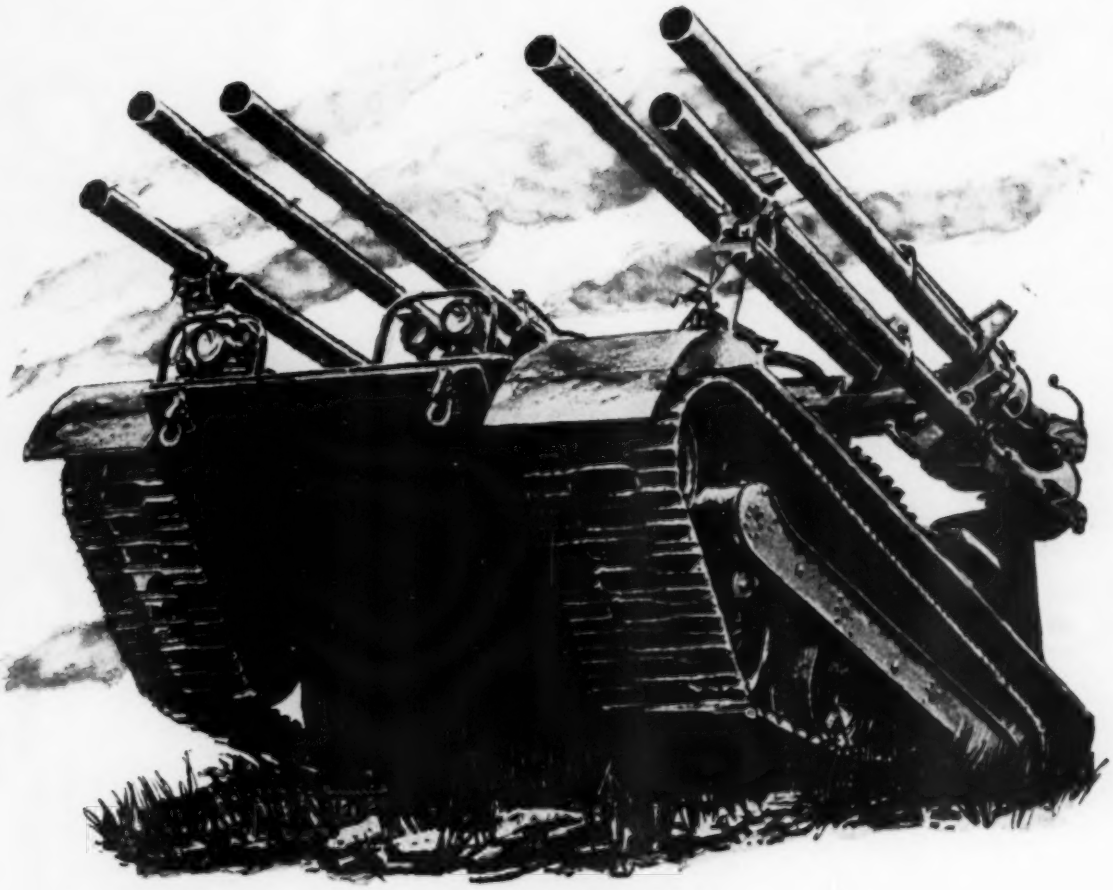

"ONTOS"! land-bound fighter with airplane-type fuel cells

Low, lean and lethal — this is the "Ontos," new land combat vehicle of the U. S. Marine Corps, with more firepower than any other in history.

Highly maneuverable, it is a hit-run weapon which relies upon its low silhouette to get in, strike and get out fast.

This low silhouette is made possible, in part, through an airplane-type fuel cell — built by Goodyear Aviation Products—which is "tunneled" so that the vehicle's drive shaft runs right through it.

By utilizing bladder cells and aircraft-type fittings to replace conventional rigid metal-tank construction — fuel-tank bounce, vibration and corrosion problems are eliminated.

Produced by Allis-Chalmers at its La Porte, Indiana, Works, the Ontos gets its name from the Greek for "the Thing." And what a thing it is: a multi-purpose combat vehicle that does the work of twelve — a feat made possible partly by aeronautical pioneering.

Goodyear Aviation Products Division is a leader in the field of fuel cells, for aircraft, boats, guided missiles and vehicles. For full information, write: Goodyear, Aviation Products Division, Dept. B-1715, Akron 16, Ohio, and Los Angeles 54, California.

GOODYEAR AVIATION PRODUCTS

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AVIATION CALENDAR

Feb. 18-20—First Astronautics Symposium, sponsored by USAF Office of Scientific Research, Air Research & Development Command and Convair (by invitation), El Cortez Hotel, San Diego, Calif.

Feb. 24-26—Sixth Annual Texas Agricultural Aviation Conference & Short Course on Pest Control, including aircraft and equipment displays, Memorial Student Center, Agricultural & Mechanical College of Texas, College Station. Fly-in participants may use Easterwood Field.

Feb. 25-26—Mid-Season Meeting, Canadian Aeronautical Institute, Ft. Garry Hotel, Winnipeg.

Feb. 26-28—Western Joint Computer Conference, sponsored by IRE, AIEE and ACM, Hotel Statler, Los Angeles, Calif.

Mar. 5-7—Fifth Annual Air Safety Forum, Air Line Pilots Assn., Hotel Shoreland, Chicago, Ill.

Mar. 7-9—National Conference on Aviation Education, Hotel Mayflower, Washington, D. C.

Mar. 11-15—1957 Atomic Exposition including Nuclear Engineering & Science Congress, 5th Atomic Energy in Industry Conference and 5th Hot Laboratories & Equipment Conference, Convention Hall, Philadelphia, Pa.

Mar. 14-15—Flight Propulsion Meeting (Classified), sponsored by IAS, Hotel Carter, Cleveland, Ohio.

Mar. 18-21—Pacific Coast Plastics Exposition, in conjunction with The Society for Plastics Industry, National Conference, Shrine Exposition Hall, Los Angeles.

Mar. 18-21—National Convention, Institute of Radio Engineers, New York Coliseum and Hotel Waldorf-Astoria, New York.

Mar. 18-21—First Military Automation Exposition, New York Trade Show Building, 500 Eighth Ave., New York. For details write: Richard Rimbach Associates, 845 Ridge Ave., Pittsburgh 12, Pa.

Mar. 25-29—Tenth Western Metal Congress, Ambassador Hotel, Los Angeles.

Mar. 26-28—Sixth Weather Radar Conference, American Meteorological Society, Cambridge, Mass.

(Continued on page 6)

AVIATION WEEK • FEBRUARY 18, 1957

Vol. 66, No. 7

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TITANIUM WELD 250X

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The microscopic inspection equipment and actual photomicrograph of a titanium automatic heliarc butt weld 250x, shown above, are typical of the quality control techniques employed by Lavelle to assure *production perfection* of critical parts and components for the aircraft industry.

Advanced facilities and methods for welding titanium and high temperature nickel and steel alloys . . . Government Certified technicians and equipment . . . *plus* careful inspection and follow-through by experienced specialists at every stage of production, add up to greater speed, efficiency and economy in meeting customers' exacting specifications at Lavelle.

Learn how this *complete* service proves the quality workmanship of the precision components you require . . . when you call on Lavelle for your fabricating needs.

Additional data on Lavelle's specialized fabricating services is contained in this illustrated brochure. Write for a copy without obligation.

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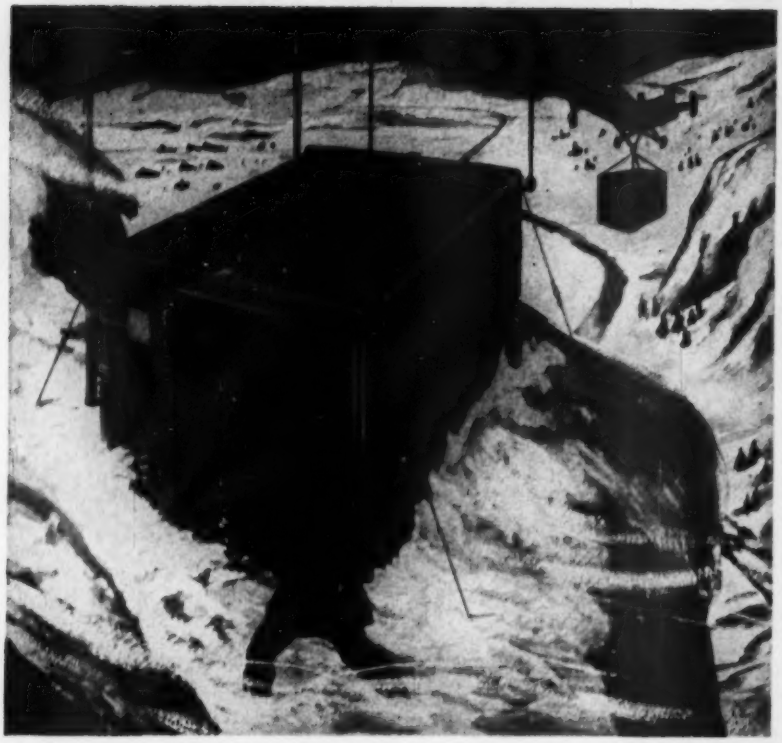


This self-contained radio relay station can be operative within minutes of landing. It carries its own antennas and has its own lighting and ventilation systems.

THE NEW CRAIG HELICOP-HUT*....
"flying" shelter that operates anywhere!

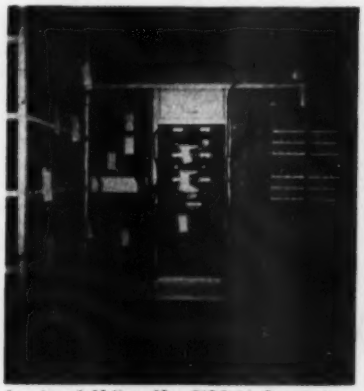
This is the Helicop-Hut, designed and built by Craig . . . a lightweight portable shelter for electronic equipment that can operate anywhere a helicopter can reach.

FEATURES:

- Light weight — 950 pounds
- Payloads — over 6000 pounds
- Insulation factor — 0.24
- Aluminum skin bonded to foamed-in-place core for maximum strength, minimum weight
- Inside dimensions — 76" x 76" x 96" long
- Meets Government specifications for world-wide use
- Special Accessories: lifting device for truck loading; quickly-attachable dolly to make Helicop-Hut mobile

USES:

AGC landing systems, missile and aircraft test checkouts, missile flight control stations, communication and navigation systems, and maintenance workshops.



Interior of Helicop-Hut TCC-11 Communications Central showing transmitters, telephone switchboard and communications equipment.

For full information, write Craig today.

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SEE THE HELICOP-HUT ON DISPLAY AT THE IRE SHOW, BOOTH 1325, MARCH 18-21.

AVIATION CALENDAR

(Continued from page 5)

Mar 27-29—Educational Colloquium on Radiation Effects on Materials, sponsored by Office of Naval Research and Glenn L. Martin Co., Johns-Hopkins University, Baltimore, Md.

Apr. 2-5—National Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, sponsored by Society of Automotive Engineers, Hotel Commodore, New York.

Apr. 3-5—Spring Meeting, American Rocket Society, Sheraton Park Hotel, Washington, D. C.

Apr. 17-20—Eighth Annual Conclave, Arnold Air Society, including aviation equipment display, Hotel New Yorker, New York, N. Y.

Apr. 22-24—Second Annual Jet Engine Hydraulics Symposium, Hotel Statler, Detroit, Mich.

Apr. 23-25—Annual Convention, International Airline Navigators Council, Piccadilly Hotel, N. Y.

Apr. 30—Atlantic Rate Commodity Rate Board Meeting, International Air Transport Assn., Torquay, Devonshire, England.

May 1-3—Spring Meeting and Exhibit Society for Experimental Stress Analysis, Hotel Statler, Boston, Mass.

May 5-8—30th Annual Convention, American Assn. of Airport Executives, Shamrock Hilton Hotel, Houston, Tex.

May 6-8—28th Annual Meeting, Aero Medical Assn., Shirley Savoy Hotel, Denver.

May 8-11—13th Annual National Forum, American Helicopter Society, Sheraton Park Hotel, Washington, D. C.

May 13-15—National Conference on Aeronautical Electronics, sponsored by Institute of Radio Engineers, Dayton, Ohio.

May 20-23—Second Annual Design Conference, sponsored by the Machine Design Division of American Society of Mechanical Engineers, N. Y. Coliseum, New York.

May 24-June 2—22nd Paris Air Show, Society of French Aircraft Constructors, Le-Bourget Airport, Paris.

June 1-9—First Annual National Aviation Trade Show, Monmouth County (N. J.) Airport.

June 23-25—29th Annual Meeting, Aviation Distributors & Manufacturers Assn. The Broadmoor, Colorado Springs, Colo.

July 2-11—24th National Soaring Contest, Elmira, N. Y.

July 12-13—British Lockheed International Aerobatic Competition, the National Air Races (third round) and the King's Cup Air Race, Coventry Civil Aerodrome, Bagington, England.

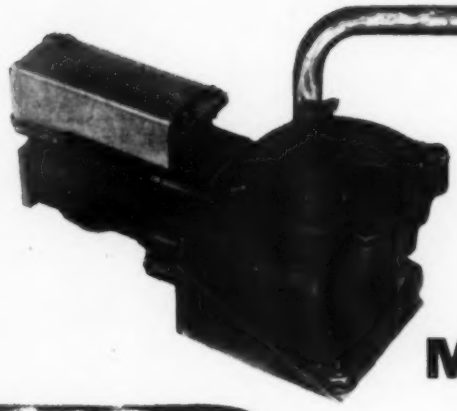
Aug. 20-23—Western Electronic Show & Convention Board of Directors, Cow Palace, San Francisco, Calif.

Sept. 1-6—Sixth International Aeronautical Conference, Royal Aeronautical Society and Institute of the Aeronautical Sciences, Folkstone and London, England.

Sept. 2-8—1957 Flying Display, Society of British Aircraft Constructors, Farnborough, England.

Sept. 9-13—13th Annual General Meeting, International Air Transport Assn., Madrid.

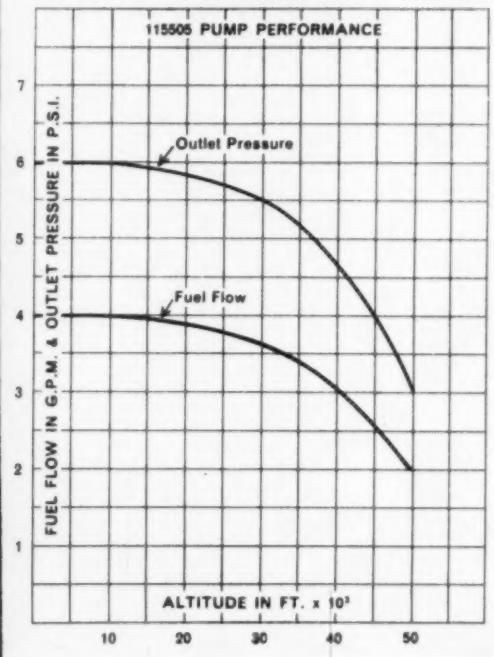
Oct. 2-4—Tenth Annual Meeting & Forum, National Business Aircraft Assn., Cosmopolitan Hotel, Denver, Colo.



MIGHTY MITE

...that pumps up every last drop of fuel even at extreme altitudes!

P/N 115505 FUEL PUMP
112V 400 CYCLE SINGLE PHASE MOTOR JP-4 FUEL 60° F



To scavenge the fuel which would normally be trapped in the lower portions of the fuel tanks – that's the job of Whittaker's AC electric motor operated continuous duty fuel pump!

And this Whittaker Ratio-Flo pump does the job with half the weight and envelope of any other pump – and at extremely high altitudes!

The unit runs continuously after fuel level reaches a pre-determined point (a float switch turns the pump on).

Since entire motor and gear train are submerged, no shaft seals are required. Pump operates on very low current, and is capable of lifting fuel, pumping air and running dry for indefinite periods. Integral motor thermal protection is optional.

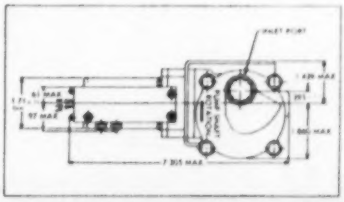
PERFORMANCE

TEMPERATURE. Ambient –65° + 216°F. Fluid –65° + 135°F.

ELECTRICAL POWER REQUIRED. 400 cycle 112V single phase alternating current.

SERVICE FLUID. Aircraft fuels (JP-4 and JP-5)

WEIGHT: 2.75 pounds. ENVELOPE: length, 6¼ inches; height, 3¾ inches; width, 3⅛ inches.



This unit is now in production and suitable for use wherever a fuel scavenging problem exists.

SEND THIS COUPON FOR COMPLETE INFORMATION

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915 N. Citrus Avenue, Los Angeles 38, Calif.

Gentlemen:

Please send me further information on the Whittaker Scavenger Fuel Pump.

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Company_____

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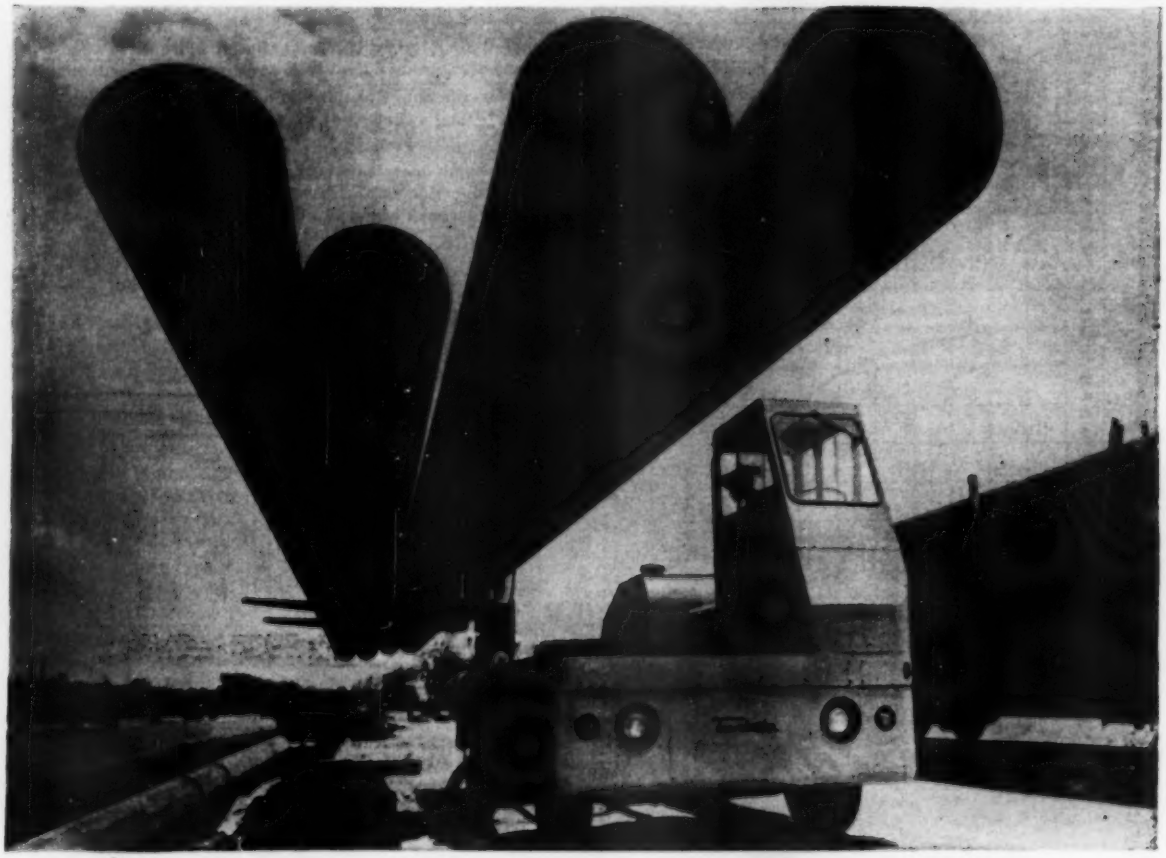
OTIS ELEVATOR COMPANY, ALWAYS THE LEADER IN VERTICAL MATERIALS HANDLING, HAS TAKEN ITS FIRST STEP TOWARDS LEADERSHIP IN HORIZONTAL MATERIALS HANDLING.

THE BAKER-RAULANG COMPANY . . .

WORLD'S WORD FOR ELEVATOR QUALITY



Among the products of The Baker-Raulang Company is the Traveloader, an entirely new concept in the field of mechanized handling of long, bulky loads. The Traveloader performs three distinct operations. It stacks like a fork truck, carries like a straddle truck, and delivers like a road truck. Gas or Diesel-powered Traveloaders are available in 6,000 to 30,000 pound capacities. A 4,000 pound capacity Electric-powered Traveloader with solid tires is available for indoor handling in narrow aisles.

OTIS has greatly expanded the engineering and research facilities of its recently acquired subsidiary, the BAKER-RAULANG COMPANY, Cleveland, Ohio. The product line has been broadened. It now includes a complete range of GAS and ELECTRIC Fork Trucks and an exclusive line of GAS and ELECTRIC side-loading Traveloader® Trucks, also Crane and Platform Trucks. You can now look to OTIS and BAKER for progress in horizontal materials handling.

.... AN OTIS SUBSIDIARY, IS THE MAKER OF

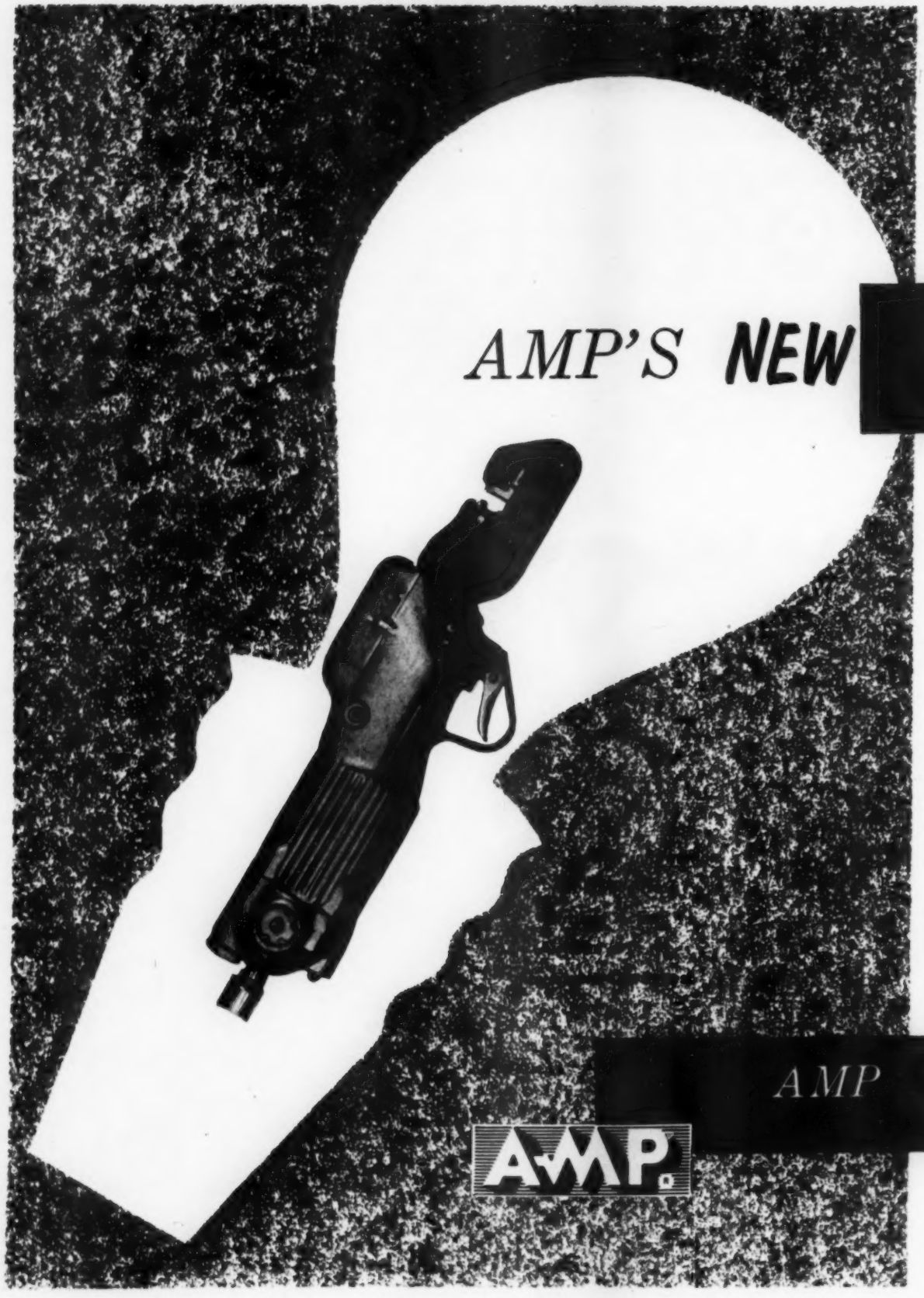
Baker

GAS AND ELECTRIC

industrial trucks

Baker's newest gasoline powered fork truck is available in many models, with capacities to 6,000 pounds. It features low initial cost, high lift, plus speed and economies of operation.

The battery-powered fork trucks in the Baker line range in capacity from 1,000 to 15,000 pounds. Baker was a pioneer in materials handling and has been producing electric industrial trucks for more than 35 years.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lightweight • compact • portable

straight-action air gun

This new AMP pneumatic hand tool augments our line of high-speed application tooling. Designed for a wide range of AMP terminal, connector and splice applications, its features include:

- Interchangeable die assemblies, with in-line crimping action to assure perfect, solderless wire terminations;
- Safety valve set to bypass when line air pressure exceeds operating requirements;
- Standard "C" type head adaptable to all types of crimping, including small wire terminations in close working quarters;
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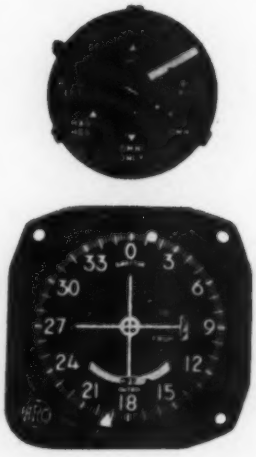
ARC's Course Director CD-1, Teamed with ARC's VOR/ Localizer Receivers 15-D, Shares the Work with the Pilot

More and more pilots rely on the ARC CD-1 Course Director to determine the exact headings required to intercept and fly a desired VOR radial or runway localizer. This electronic "co-pilot" helps them fly with pinpoint precision, greater ease and increased safety, and in four simple steps.

With ARC's CD-1, the pilot selects his VOR or localizer station, sets his Course Director to the bearing of the desired VOR radial or localizer, turns his aircraft until the vertical needle of the cross-pointer meter is centered and steers to keep it centered. His ship will intercept the selected track quickly and smoothly, simultaneously compensating for wind drift. The pilot performs no mental computations, and there's no chance of overshooting the desired course.

This reliable navigational aid adds only 10 pounds to your aircraft. Ask your ARC dealer to install the CD-1, along with a *dual installation* of ARC's Type 15-D VOR/Localizer Equipment. You'll discover how easy flying VOR and Localizers can be – and with new peace of mind.



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Dependable Airborne Electronic Equipment Since 1928

WHO is America's No. 1 source of aircraft roller bearings?

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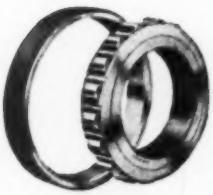
WHY?



1 **HYATT HAS MORE EXPERIENCE:** As America's *first* and *foremost* cylindrical roller bearing builder, we're the acknowledged leader in the field. Our extra "know-how" means extra help in solving tough temperature and speed problems.

2 **HYATT HAS THE TOOLING:** It's one thing to produce a successful prototype—but something else again to *reproduce* it in quantity. We have the tooling and electronic controls to assure you prototype *quality* on a *quantity* basis.

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HYATT HY-ROLL BEARINGS FOR AIRCRAFT INDUSTRY

Section of department making stators for Bendix synchros and motors

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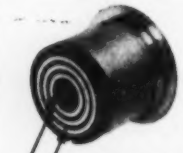
EXTERNAL SLIP RING AUTOSYNS®

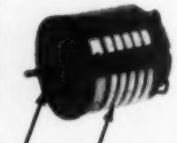
Bendix external slip rings replace ordinary fixed leads where it is desired to rotate the stator in addition to, or instead of, the rotor. Individual mechanical and electrical requirements determine location and configuration of these external rings.

As can be seen from the few examples below, many variations are possible in Bendix External Slip Ring Autosyns.



Three external stator rings in face of Autosyn.

Two external rotor rings.



Rotor and stator rings mounted concentrically with outside diameter of housing.

Rotatable gear mounted to Autosyn.

Rotor and stator take-offs are by means of brushes riding on these external rings.

Fast delivery of practically any type synchro at minimum cost. Isn't that what you want from your synchro supplier?

If so, consider how well Bendix fills the bill. First, as a virtual "supermarket" for synchros, we maintain mass production that means minimum unit prices, even to small-quantity buyers. Second, we produce virtually all types of synchros as *standard items*, meaning you can get delivery fast —*immediately*, in most cases.

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Let our vast experience and mass production facilities go to work on *your* synchro needs, too!

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Advanced versions of the Ryan jet-powered Firebee target drone—with increased speed and altitude performance—are in quantity production for the Armed Services. Developed for the Air Force, Navy and Army, the hard-to-hit, hard-to-destroy Firebee is providing a realistic yardstick for measuring and perfecting our nation's missile defense system.

A versatile "bird," the Firebee can be fitted with wing pods to carry additional fuel... a warhead... specialized photo or television equipment. With special reflective devices, it presents a realistic radar image of full-scale "enemy" aircraft.

Launched from the air, the Firebee is electronically controlled from air or ground for flights of over 150 miles radius. When its mission is completed, the Firebee is flown "home" and its automatic parachute floats it gently to earth or sea so it can be recovered and flown over and over again.

Firebees are in operational use by the Air Force (Q-2A) and the Navy (KDA-1) and Model XM21 has been supplied to the Army.

Engineers will find a challenging future with outstanding opportunities at Ryan

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ROY MARQUARDT, at 39 is the youngest chief executive officer in the aircraft engine business. A graduate of the California Institute of Technology, he was Director of Aeronautical Research at the University of Southern California prior to founding Marquardt Aircraft Co. in November, 1944.

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Engineers looking for a company to grow with, should look to Marquardt Aircraft Co. Here is why!

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In just twelve short years, the company has grown from one man's idea to an engineering and production facility employing more than 2,500 people.

But most important, Marquardt engineers have grown in skill, scope and professional ability along with the company's many exciting and rewarding projects.

Within the next two years, Marquardt will more than double its manpower. Even with this new increase in personnel, engineers joining Marquardt now will have this same opportunity to grow with the company.

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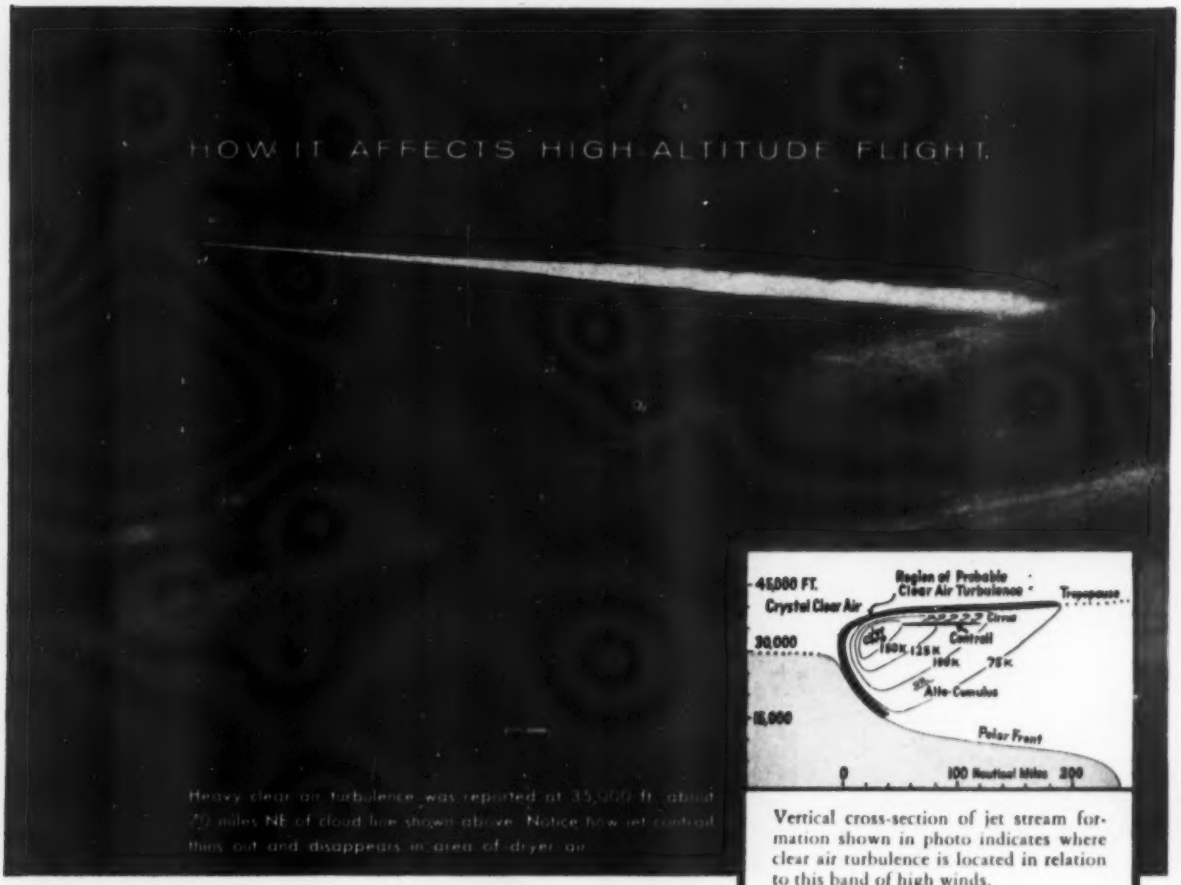

Vertical cross-section of jet stream formation shown in photo indicates where clear air turbulence is located in relation to this band of high winds.

FLIGHTS in the 20,000 to 40,000 ft. levels often encounter clear air turbulence. It is more of a cobblestone variety than the drafts associated with vertical currents in cumulus clouds. Though brief, this effect may be severe.

Clear air turbulence is caused by turbulent eddies in regions of marked windshear, that is, wherever wind velocities (speed and direction) vary sharply over short distances. It is generally associated with the tropopause and edges of the jet stream.

Conditions to watch for in flight: Haze and cirrus clouds at or near flight level. Rapid temperature changes. Fluctuations of airspeed indicator. All can indicate approaching turbulence.

What to do when turbulence is encountered: Reduce speed. This may reduce severity of jolting. Change altitude. Change direction till turbulence ceases, then resume heading.

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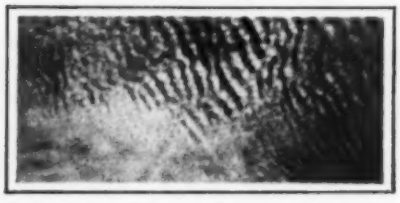

Alto-cumulus billows associated with jet stream. Cobblestone turbulence is sometimes encountered above these clouds in clear air.

Photograph courtesy Mumtalp Foundation, Fostering Pure Research in Meteorology

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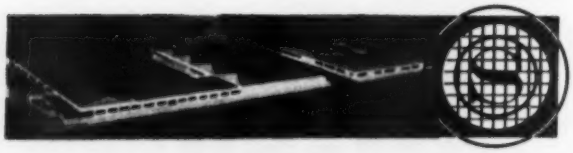

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FEBRUARY 18, 1957

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Washington 4, D. C.—National Press Bldg., Phones: NAtional 8-3414, REpublic 7-6630
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PUBLISHER.....Robert W. Martin, Jr.
EDITOR.....Robert B. Hotz

MANAGING EDITOR.....Alpheus W. Jessup
ASST. MANAGING EDITOR (TECHNICAL)
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COVER: Bell Rascal GAM-63 air-to-surface pilotless bomber is carried on underwing pylon by B-47 bomber. Light-off follows release. Rascal, designed for launching at ground target while bomber is out of reach of enemy fighters, is supersonic, has 100 mi. range (see page 34).

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The 1700-gallon jettisonable fuel tank for the Boeing B-47 "Stratojet" is only one of the many designs manufactured on Beechcraft's versatile production lines. During the Korean War, for example, Beech Aircraft Corporation manufactured 20 different types of aircraft tanks and fire bombs, establishing a production record of 400 tanks a day and delivering a total of more than 150,000 tanks to the U. S. Armed Forces.

In addition to the 1700-gallon "Stratojet" tanks, Beechcraft's "tank line" is now producing 1400-gallon tanks for Lockheed's G-130 "Hercules" . . . 282-gallon tanks for McDonnell's F3H-2N "Demon" . . . and 230-gallon and 450-gallon tanks for Republic's F-84F "Thunderstreak" and RF-84F "Thunderflash." Beechcraft's Research & Development Laboratories are busy, too, with classified projects for new aircraft tanks and refueling equipment.

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EDITORIAL

The USAF Tradition of Courage

Top leadership of the Air Forces faces a difficult problem in the Fiscal 1958 budget hearings that have just begun on Capitol Hill in Washington. It is no secret that both General Nathan F. Twining, USAF chief of staff, and USAF Secretary Donald Quarles, aspire to higher positions in the Pentagon that depend on the approval of President Eisenhower and his advisers as well as the official endorsement of Congress. General Twining's ambitions are aimed at succeeding Admiral Arthur Radford this spring as chairman of the joint chiefs of staff. Mr. Quarles hopes are directed at the Secretary of Defense post soon to be vacated by Charles E. Wilson.

Pinnacles Not Assured

Strong support of the Fiscal 1958 defense budget submitted to Congress by President Eisenhower by the USAF secretary and chief of staff would provide no absolute assurance that they would mount to the Pentagon pinnacles to which they aspire. But President Eisenhower is known for his aversion to subordinates who publicly oppose his policies. Vigorous and completely frank discussion before Congress on the deficiencies in the Fiscal 1958 budget by General Twining and Mr. Quarles could easily remove them from further consideration for higher appointments.

A number of budget cats have been jumping out of the Pentagon bag on recent national television programs dealing with the airpower controversy. Sen. Stuart Symington, chairman of the Senate subcommittee investigating the Air Force, revealed that the Fiscal 1958 budget slashed 1,100 aircraft from the USAF procurement program. Mr. Quarles also obliquely confirmed that the Boeing B-52 program may be stretched out and the maximum production rate of 20 planes per month promised to Congress last spring may in fact never be achieved.

Modernization Programs Cut

However, Mr. Quarles did not reveal the full B-52 cutback story. Actually, the USAF program for the B-52 was cut back by 140 bombers in Fiscal 1958 and the production rate will be stretched out so that the maximum rate will fall well below the planned 20 a month. There has been heavy Defense Department pressure on USAF to conceal this B-52 production stretchout and program cutback until after Congress has voted on the Fiscal 1958 defense appropriations bill.

The fact that the USAF 128 wing program involves counting wings that were never before counted in the combat roster also has been officially confirmed. It is also now generally admitted that the policies laid down in the Fiscal 1958 budget actually are aimed at reducing USAF to 112 wings by 1960.

Other aircraft programs affected in the 1958 budget slash include the McDonnell F-101B, which is virtually phased out; the Lockheed F-104 which gets a heavy cut and the Convair F-106 where a month's production has been "slipped." Even more significant is the major cut in aircraft modernization programs necessitated by the Fiscal 1958 budget. This deferred and canceled modernization means that the active inventory of USAF's first line combat strength will grow more obsolescent with each passing year as the opportunity for cranking in the latest improved equipment is missed. The vital research and development account was also hacked by more than 30% after it left the Pentagon.

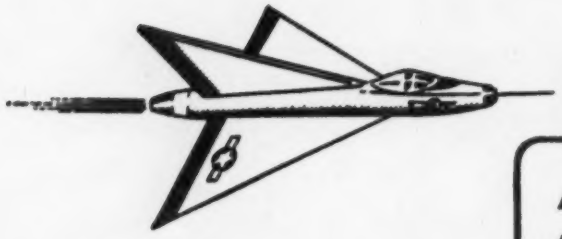
General Twining and Secretary Quarles both testified under oath before the Symington subcommittee last summer that the Fiscal 1957 budget was compounded from "one shot" economies that could not safely be repeated next year. They both specified that USAF could live with the Fiscal 1957 budget only if "substantial" increases were forthcoming for Fiscal 1958. Both supported a USAF budget of $21 billion in the Fiscal 1958 Pentagon budget discussions. Both General Twining and Secretary Quarles are fully aware of what the Fiscal 1958 budget will really do to the USAF's combat strength in relation to that of the Communist bloc.

Courage Under Fire

In a recent speech to the Air Force Academy cadets at Colorado Springs, General Twining took as his text "The Tradition of Courage" and tolled off the list of USAF officers who have displayed extraordinary courage in the face of enemy fire, in the uncharted areas of flight and under intense political pressure. He discussed in some detail the political martyrdom of General "Billy" Mitchell and the USAF officers who risked their official careers by officially testifying with the courage of their airpower convictions. He noted that these men had unflinchingly accepted exile to cow pasture airports of Texas and Kansas as the penalty for incurring official wrath.

Never in the history of the Air Force has it had greater need for its top leadership to maintain "The Tradition of Courage" blazed by its officers and men through 50 years of war and peace.

—Robert Hotz



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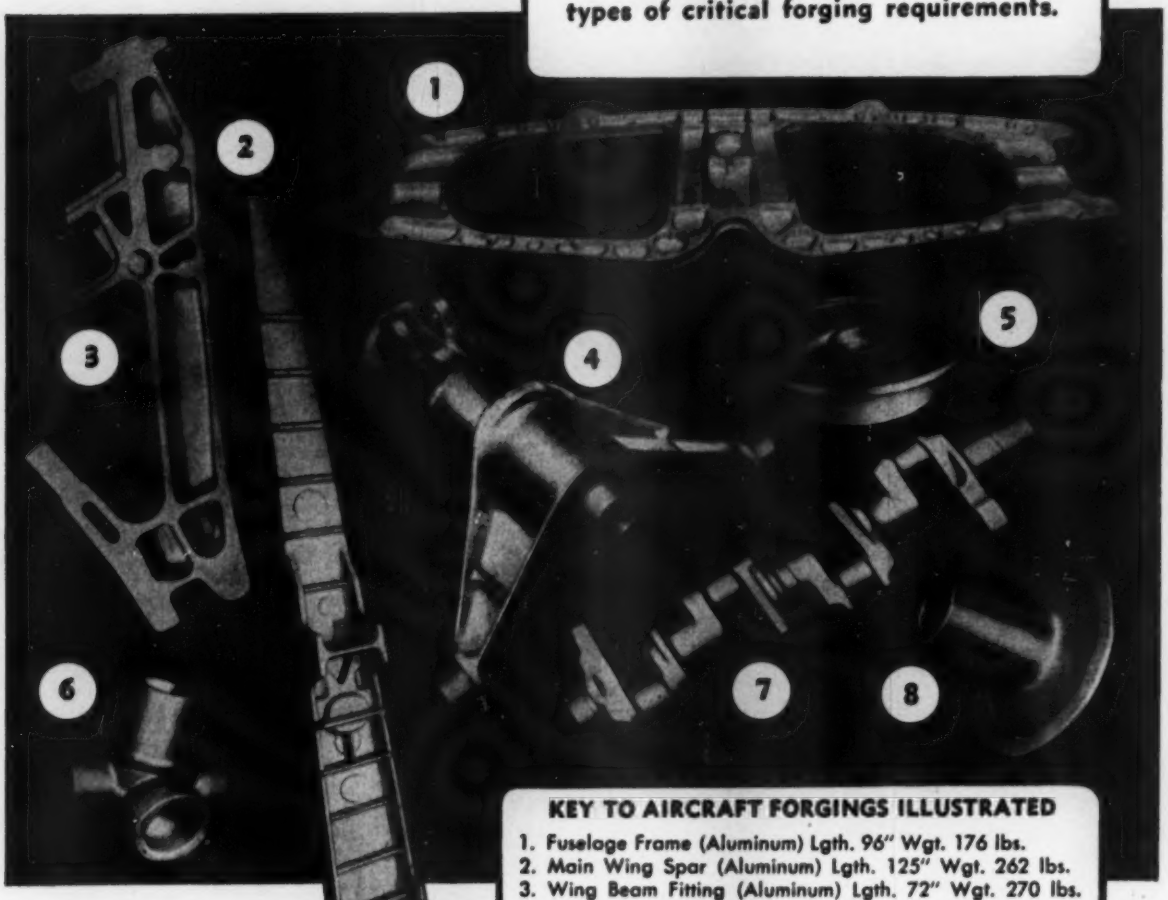

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William Albert Burns, Jr., Cincinnati manufacturing executive, a director, The Glenn L. Martin Co., Baltimore, Md.

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Norman F. Trost, president, Narmco Manufacturing Co., La Mesa, Calif.

Andrew F. Haiduck, executive vice president, Lear, Inc., Santa Monica, Calif.

Paul W. Hook, executive vice president and treasurer, The Wellman Bronze and Aluminum Co., Cleveland, Ohio. Also: **Glenn F. Ihrig,** vice president-sales.

Joseph L. O'Brien, vice president-personnel relations, Air Transport Association, Washington, D. C.

Richard G. Dinning, vice president, Allegheny Airlines, Inc.

Russell P. Mahan, vice president-purchasing, Baird-Atomic, Inc., Cambridge, Mass.

Bartlett Richards and **Harry R. Sanow,** vice presidents, Riverdale operations, Acme Steel Co., Chicago, Ill. Also: **Joseph H. Myers,** general superintendent, Riverdale plant.

Capt. Joseph W. Antonides (USN, ret.), executive assistant to the president, Reaction Motors, Inc., Denville, N. J.

Robert S. Lipp, secretary, Eastern Air Lines, Inc. Also: **G. Wesley Channell,** assistant vice president, and **Carl A. Wallen,** assistant secretary.

Honors and Elections

Charles R. (Bob) Brown, project engineer in the Westinghouse jet engine plant in Kansas City, was presented a special award of $5,000 by Gwilym A. Price, chairman and president of the Westinghouse Electric Corp. Mr. Brown received the award because of the "patience, persistence and ingenuity he displayed in developing the afterburner exhaust nozzle used on Westinghouse jet engines."

Joanne Alford, an engineer at The Glenn L. Martin Co. and "Miss Airpower of 1956," was honored by the Air Force Association for her continuing efforts to encourage junior and senior high school students to major in engineering subjects. Since November Miss Alford has spoken to 36,000 student in 40 high schools . . . she will continue to tour until May.

Roy T. Hurley, chairman and president of Curtiss-Wright Corp., received the Stevens Honor Award from the Stevens Institute of Technology for "outstanding achievement in the aeronautical and automotive industries."

INDUSTRY OBSERVER

► Russia and U.S. are making arrangements for mutual geodetic survey flights over the arctic regions including Alaska and Siberia as part of the International Geophysical Year activity. Both countries need better geodetic data on the arctic regions for missile guidance.

► **Soviet air force is engaged in a major airport construction program in the maritime provinces of Siberia. Fields are all designed to accommodate large jet bomber types such as the turbojet powered Bison and the turboprop Bear. Both Bison and Bear have appeared with Red air force operational units operating from Siberian arctic bases.**

► Lockheed QT5, drone version of the X-7 supersonic ramjet test vehicle, was destroyed in a crash at White Sands Proving Ground. One difference between the QT5 and the X-7 is that the former uses a different, and larger, Thiokol solid booster. Powerplant slung beneath the belly is a 36-in. Marquardt engine scheduled for use in Boeing's Bomarc surface-to-air missile.

► **Despite Pentagon announcements that the McDonnell F-101B program has been "reduced" and its planned production "slowed down," the company is confident that its performance will justify continued orders. First flight of the F-101B may come before April 1. McDonnell's new Navy design, the F4H, is scheduled to make its first flight sometime in December.**

► Bell Helicopters is using an adhesive bonding firewall sandwich structure on one of its new helicopters, probably the XH40 or YH40. Structure is composed of titanium and fiberglass skins with aluminum honeycomb and represents the first production bonding of titanium.

► **Aerojet-General Corp. may open an office in Japan as a prelude to forming a new company in association with a Japanese defense firm. Office would concentrate upon sales of off-the-shelf items such as JATO and Aerobee rockets, while its management made a survey of Japanese industry. If it forms a new company, Aerojet would provide most of the money, some of the top-level management and technical personnel. Best bets to join with Aerojet in the venture are Mitsubishi Heavy Industries and Fuji Heavy Industries.**

► Watch for a new effort by the aircraft industry to stimulate the flow of information concerning the sonic boom and its effects. Industry for the most part is more conservative than the military in its approach and analysis of the probable effect of a sonic boom on ground structures and personnel. At least one company—McDonnell Aircraft Corp.—plans to hold a research level conference with Air Force experts to explore new areas for investigation and uniform standards of tolerance.

► **Princeton University is investigating stability and control characteristics of unducted flying platforms for the Army's Transportation Research and Engineering Command.**

► Operational difficulties shown up during the recent Strategic Air Command alert during the Suez crisis have resulted in a USAF shakeup. SAC found that some bases to which its bombers were dispersed were unequipped to handle them. As a result, some bases previously not under Gen. LeMay's command now have been assigned to SAC. Thule is one of these.

► **Kaman Aircraft's HOK-3 helicopter powered by a Lycoming T53 gas turbine engine has completed a 50-hour tiedown test and is now undergoing a 100 hour flight test program. Air Force has placed a contract for the HOK-3 for the Army.**

► Israel has liquidated its contract for 24 Sabre F-86 Mark VI aircraft with Canadair Ltd. following the Canadian government's embargo on shipment of aircraft to the Middle Eastern country. Canadair has returned the $2 million paid by Israel for the first eight aircraft which will now go to the Royal Canadian Air Force.

► **Britain's first guided missile regiment is now being formed to handle the American Corporal.**

HOW THE SILICONES MAN HELPED...

Build a Gyro for Straight Shooting!

Accuracy that could hit a fly from a screaming roller coaster . . . so rugged that it can be used to drive nails without impairing its operation. That's the "impossible" fire control gyro built by Minneapolis Honeywell, Aeronautical Division. Known as the HIG-5 (Hermetic Integrating Gyro), lightweight and small enough to hold in the palm of your hand, it supplies the "sense of balance" necessary at supersonic speeds.

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Fabricated by Moxness Products Company, Racine, Wisconsin, these "O" rings were tested from −65 to +200 deg. F., at simulated pressures from ground level to operational altitudes. Under such rigid tests, UNION CARBIDE Silicone Rubber showed outstanding sealing qualities and resistance to compression set.

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Washington Roundup

Fight for Procurement Pie

Watch for more heat than usual in the annual Washington battle over the small business cut of Defense Department's procurement pie. Military services, faced with purchase of increasingly complex and expensive items, find it more and more difficult to buy from small business without sacrificing economies, but they are trying hard.

Meanwhile, the Defense Department itself has not helped their arithmetic by changing the ground rules. USAF, for example, always followed a policy of letting small business decide what bids it was interested in and determining the small business potential out of all contracting. Policy was to seek bids from all firms that had shown interest and volunteer bid sets to firms to encourage bidding. When no interest was shown, the item was dropped from the small business potential.

Now, the Defense Department says an item is small business potential if the bid set is sent out. Under its liberal policy of distribution, USAF last year sent out bid sets for $70 million of business to small firms for which no interest was shown. Despite this lack of enthusiasm, the items are now added to USAF's small business potential. Effect may be to discourage buyers from pressing contract information on small firms.

Agreeable Loser

Despite his announced support of USAF's proposed $17.7 billion budget for Fiscal 1958, Air Force Secretary Donald A. Quarles admits he originally sought $21 billion. Facing sharp questioning on NBC's "Meet the Press" television program, Secretary Quarles argued that he will be able to do the "necessary job" with $17.7 billion but agreed that he had wanted $21 billion. The Secretary also said he believes Russia has guided missiles it could use against Britain and France as threatened in the Suez crisis but said he doubts they would be important in a general war.

Jump in Fuel Costs

The price paid by USAF and Navy for jet aircraft fuel has already increased 4.46% because of Europe's present oil shortage and is likely to reach a 6% increase by July. In 1956, the services spent $354 million for jet aircraft fuel—one-third of the total Defense Department outlay for fuels. A 6% price rise would mean an additional $21 million annual outlay.

There is strong pressure from both Congress and Defense Department on the petroleum industry to hold at least the present price line.

General Aviation Report

General Aviation Facilities Planning Group will submit its extensive report on general aviation activities to Presidential Aide Edward Curtis sometime during the first week of March. Results of the survey, which will provide the Curtis group with the only complete data on general aviation facilities available, spells out probable requirements for the next 20 years. The lengthy report is divided into four main sub-headings—composition of general aviation today, present operating pattern of the general aviation fleet, forecast of general aviation aircraft and equipment characteristics and general aviation operations in 1976. Research and study for the report was begun last June and conducted voluntarily without the aid of federal funds by a group consisting of 11 trade associations related to private, business and executive flying.

Local Airlines Split

Remaining members of the divided conference of Local Service Airlines will meet in Washington this week to decide on the fate of the organization. Crisis developed last week with the sudden withdrawal of Bonanza, Central, Frontier, Lake Central, Ozark and West Coast Airlines. Chances are that the conference will survive the break since the action probably was taken as a bargaining wedge to obtain unanimity on government guaranteed loans for aircraft, an issue which has caused a sharp split among the member carriers. There also is no indication that the resigning members will attempt to organize a separate organization to represent them on this and other issues peculiar to local service operations. The Conference of Local Service Carriers was organized in 1953 to handle local service airline problems that would not necessarily fall within the scope of Air Transport Assn. activities.

More Airmail

Post Office Department says the volume of domestic airmail will continue to increase substantially during Fiscal 1958. The department estimates that postage revenue will climb from $141.5 million in Fiscal 1957 to $146.2 million for an increase of a 3.3%. In Fiscal 1956, the postage revenue of $137 million was almost $10 million below the anticipated revenue for Fiscal 1958.

Payments to air carriers for domestic mail transportation, the Department said, should increase to $59.5 million in Fiscal 1958, from $51.5 million in Fiscal 1956 and $55.6 million in Fiscal 1957.

Ross Investigation

Assistant Secretary of Defense Robert Tripp Ross, now on leave-of-absence, made his first appearance on Capitol Hill last week in connection with congressional investigations into a possible conflict of interest between his government position and his association with clothing firms owned by his wife and brother-in-law which hold more than $5 million in military contracts. Ross testified in closed session before the Senate Permanent Investigating Subcommittee headed by Sen. John McClellan (D., Ark.). Staff investigations by the McClellan Subcommittee and the House Military Operations Subcommittee headed by Rep. Chet Holifield (D., Calif.) are continuing.

Positive Traffic Control

Airlines are rewriting their operations manuals as a result of a recent move by the Air Transport Assn. to establish more positive control of traffic at altitudes of 18,000 ft. and above. Essentially, the ATA wants the airlines to file instrument flight plans for all flights operating at such altitudes in order to provide a fixed separation of en route traffic. Several airlines already had adopted such a procedure and remaining carriers will have the new ruling in effect by the end of the month.

—Washington Staff

Sandys Calls for New British Program

British defense minister plans drastic revision of defense in which missiles may replace manned aircraft.

London—Britain's defense leaders are engaged in a drastic revision of this nation's defense policies which will replace manned aircraft with ballistic rockets and anti-aircraft guided missiles.

The reappraisal is taking place under the threat of a Russian ballistic missile with a nuclear warhead which Defense Minister Duncan Sandys says is capable of traveling 5,000 mph. at heights of over 100 mi., a much enlarged version of the German V2s which hit London during World War II. It is believed to have sufficient range to strike Britain from Soviet-controlled territory.

Sandys outlined for the House of Commons the course which the new defense program will take. He warned that the government soon will have to announce some "very difficult and awkward decisions." Specific details of the program will not be made public until the government puts forth its annual white paper on defense in a few weeks.

Sandys made it clear that this is to be no minor slashing of defense funds but a complete overhaul of the nation's military theories and objectives. "The present superiority of the means of attack over defense, coupled with the catastrophic consequences of thermonuclear war, virtually determined the course we must follow," he said.

One result of the reappraisal has been to swing Britain into line with the "massive retaliation" policy of the United States.

Sandys said there is no doubt that the peace and safety of the world depends on the atomic deterrent, "the power to meet attack by instant and devastating retaliation." He said development of the first British megaton bomb is almost complete and Britain now has atomic bombs in steady production with a substantial stockpile already in the hands of the RAF.

The best means of delivery is not manned bombers but nuclear ballistic projectiles, Sandys said, adding, "It is clear that the effectiveness of our deterrent power will depend on the possession by us of these weapons."

There will be close cooperation with the United States in this field, he said. His statement seemed to confirm reports that one result of his visit to Washington was a promise of American ballistic missiles for Britain.

It is clear from Sandys' remarks that Britain is planning only one more generation of fighter bomber aircraft after which their task will be taken over by guided weapons. He warned that even now it is too much to expect that all of Britain can be protected by fighters. Fighters will be confined to the more limited role of protecting the bases from which British bombers or missiles would rise for a retaliatory punch against Russia. "If the nuclear deterrent is to be effective the potential aggressor must be convinced that he can not reasonably hope by a surprise attack to knock out the Allied bomber forces before they can take off," Sandys said.

Sandys statements mean that the English Electric P. 1 probably will be the last British fighter. Limiting its role to protection of bases writes off large scale production even for this final supersonic fighter. This is a blow not only to English Electric, which had hoped for a long future for its promising new aircraft, but also to such firms as Hawker which was designing a supersonic fighter with its own money.

With Sandys' bold stroke, Britain is the first nation to publicly declare a policy of cutting off fighter design in favor of guided weapons. The advanced timetable for missiles also has caused Britain to write off more advanced types of bombers. It is these, "very difficult and awkward decisions," affecting the aircraft industry which will be made public shortly. Sandys did not make it clear whether the government will go ahead under its new program with development of the Avro supersonic bomber or stop with the present generation of V bombers.

The Royal Navy's role in the future may be limited to an antisubmarine force, Sandys hinted. Well equipped ground forces will be maintained, he said, but the size of these must be considered in the light of the economic burden on Britain.

Sandys told the house that for his drastic reshaping of British forces, "I have all the authority that I need." He added: "What is far more important I have got . . . the full and active cooperation of my colleagues in the service departments."

Sandys' elaboration of the new defense policy came hard on the heels of a visit by General Lauris Norstad pleading in his role as NATO commander that strength of Allied forces in Europe be maintained. Norstad collided head on with Prime Minister Macmillan's insistence that Britain must cut her contribution to maintain her own economic strength.

Also in England for defense talks were General Earl Partridge, Continental Air Defense commander, and James H. Doolittle, chairman of the United States Scientific Advisory Board.

Hunter and Javelin

Discussing the British air defense in Parliament, Secretary of State for Air George Ward said the Hawker Hunter and Gloster Javelin fighters are capable of intercepting any Russian bomber likely to be sent against Britain at this time. He said also that British bombers are as good as any similar aircraft held by the Allies. Ward said:

"In any global war it is most unlikely that more than a comparatively small part of the entire Russian bomber force will be directed against Britain. The Russians, if they are to prevent retaliation on a large scale, will have to take on simultaneously targets and bases spread throughout the world.

"The resources they can afford to use against Britain are not so great as to make fighter defense impossible. Fighters are necessary to make the Russians understand they can not evade retaliation because they can not destroy at their pleasure the bases from which the bomber force would operate."

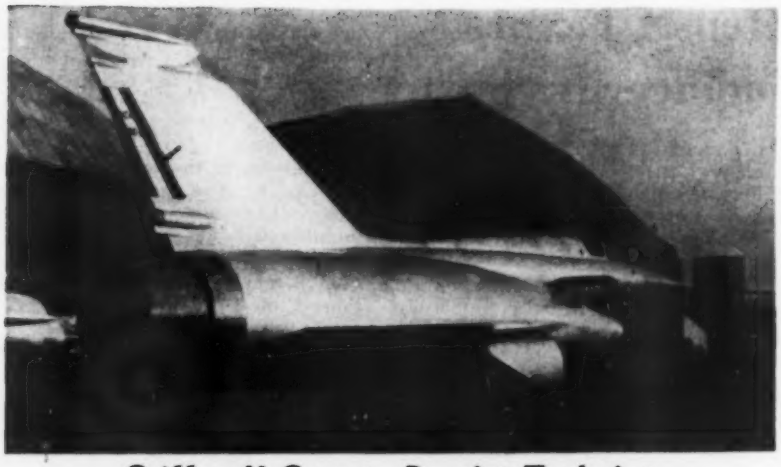
New Aviation Bills Introduced in Congress

Washington—Legislation directing Civil Aeronautics Board to award permanent certificates for U.S.-Alaska scheduled operations has been introduced by Rep. Joseph O'Hara (R.-Minn.).

Similar legislation was passed last year by the Senate but eliminated by the House from a bill authorizing permanent certificates for intra-Alaska operations.

The affected carriers are Alaska Airlines, Pacific Northern Airlines and Northwest Airlines. Other new bills:

- **Aviation Medicine.** A measure by Sen. Warren Magnuson (D.-Wash.), chairman of the Senate Commerce Committee, would establish an Office of Civil Aviation Medicine in the Civil Aeronautics Administration.
- **Heliports.** Legislation by Rep. George Fallon (D.-Md.) would require the Secretary of Commerce to make a study to determine the feasibility of including heliports in the $52 billion 13-year highway construction program.
- **Aviation Liability.** Legislation by Sen. Spessard Holland (D.-Fla.) would expedite the settlement of claims for property damage, personal injury or death due to military plane crashes.



Griffon II Goes to Ramjet-Turbojet

First photograph of French Nord Griffon II experimental interceptor shows layout change for adoption of a turbojet-inside-ramjet powerplant as in Leduc 022 parked in left background (AW Jan. 21, p. 32). New Griffon version, replacing shelved Griffon I which was powered by Snecma Atarf 101-G turbojet rated at 9,700 lb. thrust, also uses Atar turbojet. It retains canard layout and fairing above intake, which appears to modify flow beneath canard surface. Tailpipe indicates arrangement for shroud cooling vents. Anti-spin parachute is housed on top of rudder. Low pressure tires provide rough field capability similar to that of Entendard IV. Biggest Griffon II change is in longer tail, much larger diameter of tailpipe, and elimination of tailpipe keel arrangement.

Navy Attack Carrier Program Plans Constant Force of Fifteen

Washington—U.S. Navy attack carrier program calls for a constant force of 15 carriers through 1966 with six on steady duty—two in the Mediterranean four in the Western Pacific.

By 1966, according to the schedule, six of the carriers will be nuclear powered, six will be of the Forrestal class and three modernized carriers of the Midway class.

The Navy launched a congressional drive to win support for its nuclear-powered carrier program with the issuance of a 15-page illustrated brochure. The presentation placed no price tag on a nuclear carrier but argued that the ship will save $31 million in its first two years by eliminating the need for fuel oil and the logistics problem of feeding it to a ship at sea.

D-Day Plans

Actual estimated cost of the nuclear-powered carrier is $310 million. The Forrestal, christened in December of 1954, is valued at $197,859,000. Presumably, the Saratoga and four other conventional engined sister ships will cost more than the Forrestal.

The Navy pamphlet, prepared by the Bureau of Ships and distributed on Capitol Hill over the signature of Admiral Arleigh Burke, Chief of Naval Operations, says that a minimum of 15 carriers is essential because not more than 30-40% of the total strength should be deployed in normal times. This means that nine of the carriers would operate from U.S. bases for maintenance or training exercises. In an emergency, most of them could put to sea, just as 12 were deployed during the Suez crisis last November. D-day plans, the Navy said, call for the deployment of the full 15-carrier strength.

What Carrier Can Do

In addition to funds to start the nuclear-powered carrier program, Navy seeks to include in its Fiscal 1958 budget funds for continued modernization of Essex class carriers, building up to seven of these ships in 1959 and then retiring them, one a year, through 1965. The schedule calls for six Forrestal-class carriers by the end of 1960.

The nuclear-powered carriers would be added one each year from 1961 to 1966. Navy contends that the carrier is the equivalent of an air base with a runway 10,000 ft. long, operating as many planes as the average land base.

With no reference to the Air Force, the brochure makes these claims for the carrier:

- **It does not depend upon political** property (as USAF overseas bases do) and moves in an area where nuclear fall-out is at a minimum and decontamination is simple.
- **It can be supported overseas** by mobile logistic forces.
- **It is an elusive target** and can move at more than 30 kt.
- **Its mobility permits** great strength to be mobilized against an enemy at unpredictable places.
- **It forces the enemy** to dilute his defenses and to scatter detection forces.
- **Diversified aircraft** make the carrier capable of waging any type of aerial warfare.
- **When deployed,** the carrier maintains continuous readiness.
- **Air and anti-submarine** defense are part of the carrier as a weapon system and exert continuous pressure on the enemy.

The Navy says the nuclear-powered carrier, designated the CVAN, is justified because it has a secure place in the military arsenal for the foreseeable future. Because of its experience with its nuclear-powered submarine, the Navy does not consider the new carrier an experimental project. It says the project is technically feasible at this time, is needed and should be started.

The ship will have twice as much space for storing aviation fuel as the Forrestal. This means it will be able to conduct air operations for at least eight days as opposed to three to five for conventional carriers. Elimination of stacks will permit installation of new high-performance radar.

In its pleas for further modernization of existing World War II carriers, the Navy cites figures to show they are safer for pilots once angled decks, steam catapults, heavier arresting gear and larger deck-edge elevators have been added.

On the older Essex-class carriers there are 2.31 major accidents for each 1,000 landings, .46 of them fatal. Once modernized, the figures fall to .55 major accidents for each 1,000 landings, .11 of them fatal.

Shortage of Funds Cuts RAAF Flying

Melbourne—Shortage of funds has caused considerable cuts in the flying operations of RAAF.

Training flights have been restricted to what senior officers describe as "completely inadequate minimum" and gunnery exercises have been curtailed. One of the largest gunnery ranges has not been used for several months.

RAAF's increased budget allowance has been swallowed by considerably increased operating and maintenance costs as well as large expenditure in connection with VIP flights.

Furnas Leaves Defense, Favors Abolishment of Engineering Post

Washington—Dr. Clifford C. Furnas left his desk at the Pentagon last week with the blunt statement that he does not approve of the Defense Department's division of responsibilities between assistant secretaries for research and development and engineering.

Returning to his post as chancellor at the University of Buffalo after 18 months as assistant defense department secretary for research and development, Dr. Furnas says he does not concur with Defense Secretary Charles E. Wilson on the present organization which gives Frank D. Newbury, assistant secretary for engineering, a strong voice in determining the fate of advanced development projects.

In Dr. Furnas' opinion, there should be a single office with jurisdiction over research and development projects with the engineering aspects handled by a deputy of the assistant secretary. Abolition of Newbury's job, which was created by Wilson, has been advocated several times in the past. Known originally as the assistant secretary for applications engineering, Newbury has been widely criticized by research and development experts, particularly in testimony by Trevor Gardner, former assistant secretary of the Air Force for research and development.

A conflict between Dr. Furnas and Newbury goes back almost a year to a memorandum issued by Secretary Wilson that appeared to deprive Furnas of more than half his authority. Dr. Furnas, former director of the Cornell Aeronautical Laboratory, threatened to resign if Newbury was allowed to hold veto power over development projects (AW March 5, p. 27).

Research and development experts in the armed forces, including USAF Secretary Donald A. Quarles, supported Furnas with the plea that they had been struggling for years to keep production experts from interfering with development.

The dispute ended in a compromise, and Furnas stayed in office. But it was clear from his parting blast that the retiring assistant secretary still feels strongly that Newbury's office should be abolished.

Dr. Furnas said each of the armed services should have an assistant secretary to specialize in this work. Only USAF has one at the present time. Other observations by the retiring secretary:

- **Nuclear-power** airplane project has been slowed down, for technical reasons involving weight and shielding. The original development schedule was too optimistic.
- **Chemical bomber** also is being stretched out, primarily because the Air Force is not convinced it will provide a large enough increase in performance to warrant heavy expenditures at this time.
- **Fiscal 1958** research and development budget of $1.6 million is a "workable" amount, but plans must be laid now to increase it in future years, at least partly because of the dollar's lowered purchasing power.
- **More of future budgets** should go for "background R & D" that will improve the components of weapon systems and make new ones possible. An example of this is the need for gas turbine engine blades capable of withstanding temperatures 400 to 500 degrees higher than the present levels.
- **USAF's North American Navaho** missile is progressing at the normal rate, and Dr. Furnas knows of no plan to curtail the project.
- **The Vanguard satellite** program looks more promising than it did a year ago but there is still no guarantee it will be a success.
- **Evaluation of the relative** merits of the Douglas Thor and Army Jupiter intermediate range ballistic missiles probably will be made by Eger V. Murphree, special assistant to Secretary Wilson, who will make a recommendation if there is any choice between them.
- **Russia is closing** the technological gap but remains a "long way behind" the U.S. Russian aircraft do not perform as well as American planes, and there is no evidence that they are any more advanced in their missile programs.

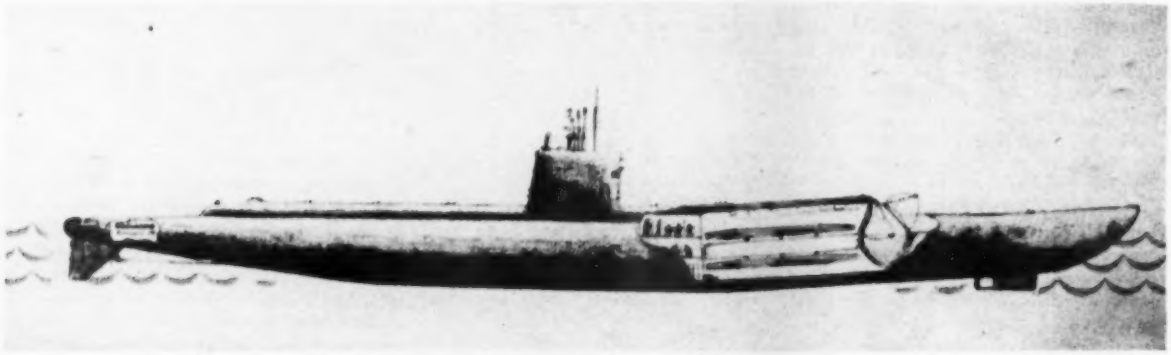
UAW Creates Unit To Organize Engineers

Detroit—An all-out campaign of the United Auto Workers to organize engineers in aircraft and allied industries will be spearheaded by a new Aircraft and Avionics Engineering Council created as part of UAW's National Aircraft Department.

Along with higher minimum wages, organization of engineers has been set down as one of UAW's major goals for 1958 (AW Feb. 11, p. 31).

Announcing the formation of the new council, Leonard Woodcock, UAW vice-president, said last week that the industry's shift from piloted aircraft to missiles is drastically changing the composition of the labor force because of the growing need for technical and professional employes, ranging from aeronautical engineers and electronic engineers to physicists and mathematicians.

He said membership in the new coun-



Internal Submarine Hangar

Artist's version of manner in which ballistic missiles may be stored in internal hangars in nuclear-powered submarine. Missile-launching, nuclear-powered sub, designated SSN 588, is being built at Mare Island Naval Shipyard, Vallejo, Calif. (AW Feb 11, p. 28). Another SSN 591, is planned. Subs probably will carry Navy's fleet ballistic missile, the Polaris (AW Jan. 7, p. 32).

cil will permit professional workers "to join with the production and office workers in the same corporation and industry to gain recognition and to effectively present and achieve their demands."

First test of UAW's popularity among engineers will come next week when the Federation of Honeywell Engineers at Minneapolis votes on a proposed affiliation with the union. Now part of the Engineers and Scientists of America, an independent group, the Honeywell organization has been facing pressure to abandon "pure professionalism" in favor of "more muscle" of the type UAW promises to supply.

Nuclear Unit Begun By Pratt & Whitney

East Hartford, Conn.—Pratt & Whitney has established a separate unit to develop its nuclear aircraft engine. General manager of new unit, the Connecticut Aeronautical Nuclear Engine Laboratory (CANEL), is Bernard A. Schmickrath, a veteran of 19 years engineering service with the company.

The new organization, announced by Wright A. Parkins, vice-president of United Aircraft, will operate at a new Air Force facility in Middletown, Conn.

The Pratt & Whitney nuclear project was established in 1951. Chief engineer for the operation is Clarence E. Holtsinver.

Creation of CANEL gives Pratt & Whitney three operational units. The other two are:

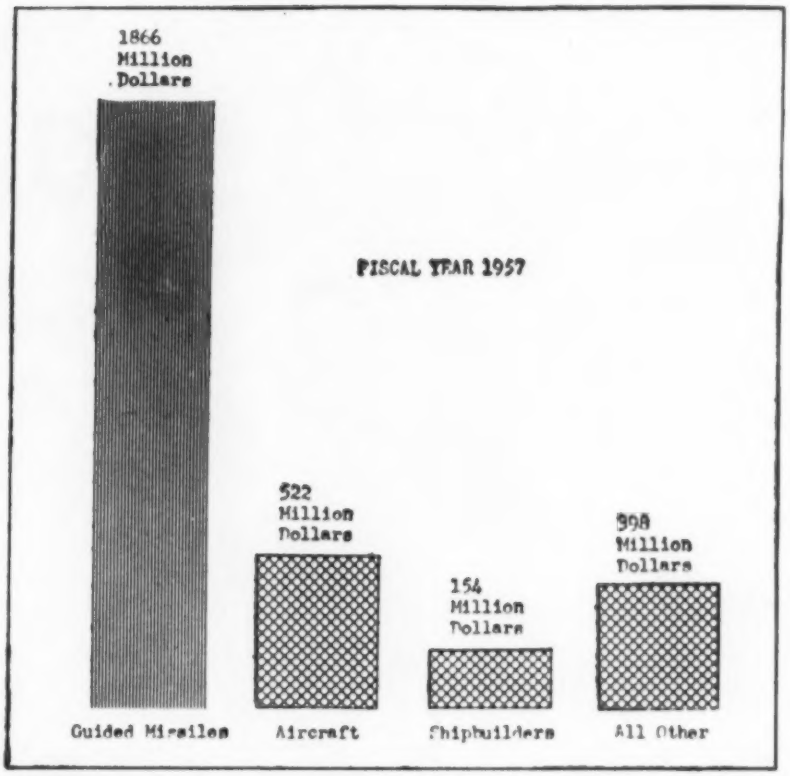
- **Connecticut operations,** including the main East Hartford facility and branch plants in the state. Leonard C. Mallet is general manager.
- **Florida operations,** which will be conducted in a new development and test center now under construction at West Palm Beach. Charles T. Roelke is general manager.

Share Boost for United

East Hartford, Conn.—United Aircraft Corp. stockholders will vote April 9 on a proposal to double the authorized number of common shares.

The increase from 7.5 million to 15 million shares recommended by the board of directors does not mean the new issue will be placed upon the market at once.

Board Chairman H. M. Horner says the directors believe company growth and capitalization warrant more stock, but it will be held for issue as dividends or to raise additional capital if necessary in the future.



DEPARTMENT of Defense chart shows Fiscal 1957 funds for development, test and evaluation. Controversy has developed between a congressman and the Aircraft Industries Assn. over how much goes for "pirating" of engineers.

AIA Disputes Davis Statement, Defends Industry Hiring Practice

Washington—Aircraft Industries Assn. strongly disagreed last week with conclusions reached by Rep. James C. Davis on defense contractors' use of tax dollars to hire engineers (AW Feb. 11, p. 25).

Rep. Davis (D.-Ga.), a member of the House Post Office and Civil Service Committee, studied a Navy report on 37 firms whose business was predominantly defense and 17 firms whose business was primarily commercial.

He then released a statement saying "evidence is accumulating that tax money is being used to subsidize the pirating of engineers for government defense contracts." Davis also said "the firms with defense contracts spent over 10 times as much for recruiting."

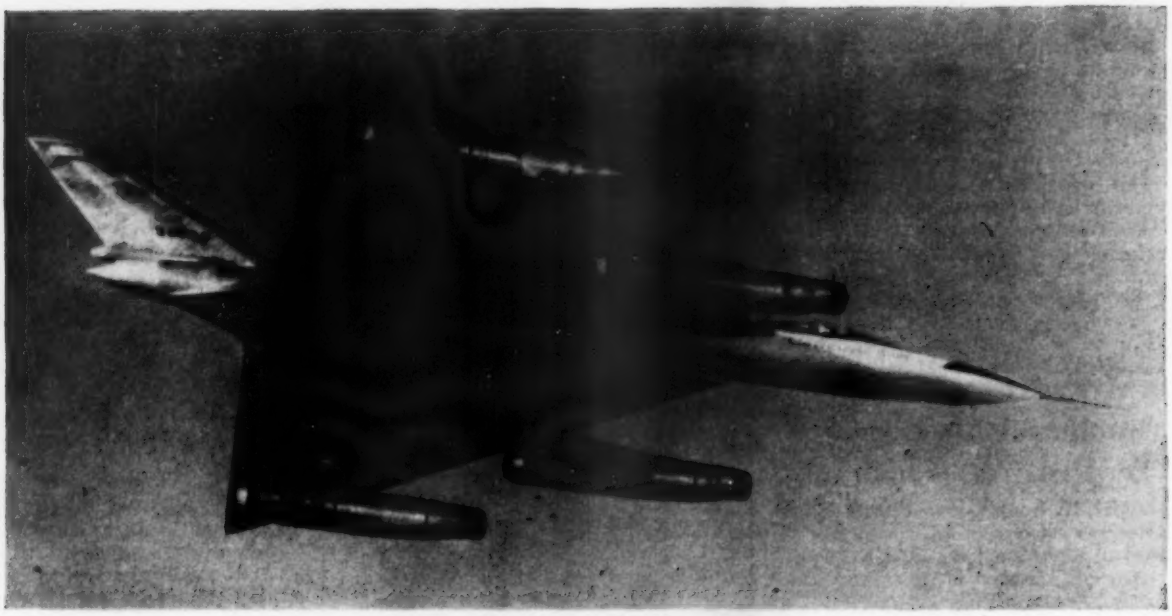
AIA said Davis' statement failed to make two things clear:

- **That he was using** a total figure for 37 firms and comparing it with the amount spent by less than half that number of commercial firms.
- **That the 37** firms hired 7,913 employes with what they spent, while the 17 commercial firms hired only 1,224.

The AIA said the Davis statement also tends to:

- **Divert attention** from the fact that the shortage of engineering manpower is a national problem—not a defense-vs.-commercial or an industry-vs.-government contest.
- **Overlook all that industry,** government and the nation's schools and universities are doing in an attempt to use existing engineering manpower more efficiently and increase the number of engineers and technicians produced by the educational system—in other words to solve their mutual problems cooperatively.
- **Overlook the fact** that companies involved in urgent development of such complex defense weapons as the intercontinental ballistic missile must look farther and spend more to recruit the quality and amount of engineering talent they need and must expend more engineering effort per dollar of sales than a commercial firm.

With his statement, Rep. Davis released some of the Navy statistics. He concluded that the 37 defense contrac-



New Hustler Flight View

New belly view of Convair B-58 Hustler emphasizes area rule dictated fuselage and podded powerplant layout. General Electric J79 engines with afterburner can develop 14,000-18,000 lb. thrust (AW Dec. 17, p. 26). Conical camber wing cuts induced drag.

tors spent an average of $1,317 for each new engineering employe they hired as compared with $985 for the 17 commercial firms.

The Navy study shows an average cost of $808 per new employe for the defense firms and $502 for the commercial firms.

The difference is that Rep. Davis divided total recruiting costs by the net gain of employes—new ones hired minus old ones lost. The Navy divided total costs by the number of new employes hired.

Using the Davis method, a company which spent $80,800 to hire 100 new employes, but lost 98 in the meantime, would appear to have spent $40,400 on each of the two employes it gained overall.

Members of SEATO Will Ask U.S. To Supply Defense Aircraft, Missiles

Melbourne—Several members of the SEATO Organization are expected to ask the United States to assume greater responsibility for supplying aviation equipment and missiles for defense purposes in the South-East Asian area.

It is understood that such demands will be submitted during the March 1957, conference of SEATO Council and its military advisers in Canberra, Australia.

Those expected to participate are: the United States, France, Great Britain, Australia, New Zealand, Thailand, Pakistan and the Philippines.

Re-Examine Position

The military advisers will re-examine the strategic position in the light of new weapon developments. It is felt that U.S. missile bases should be established in some territories and that some of the very preliminary work already accomplished in this direction should be expanded.

It is understood that, for the time being at least, the U. S. is most reluctant to entrust its own missiles to other countries but that it realizes its obligations under the SEATO treaty and will try to provide necessary quantities of missiles for defense and counter-attack in the SEATO area.

SEATO Training

U.S. servicemen will be the only ones entrusted with actual missiles but members of at least some of the armed forces of other SEATO members will be trained in the use and auxiliary work connected with missile operations.

Military experts, including some top military aviation officers, are inclined to believe that the defense and counter-attack activities in case of Red military threat cannot be based on missiles only. Conventional military aircraft will be needed and with British inability to supply them it is expected that the U.S. should make some form of arrangement to enable the member countries of SEATO to receive warplanes including transport assault planes.

Utilize Personnel

Countries like Australia feel that the U.S. should help to utilize the well-trained Australian flying personnel by providing some warplanes either as a token of its assistance to SEATO or as part of some special plan or, at the worst, on the basis of some payment spread over a number of years and payable, partially at least, in local funds and not in dollars.

It is agreed that the U.S. attitude towards these demands is completely unknown and will not be enunciated until the Council of SEATO discusses the matter in Canberra.

All present defense plans, which might be changed in March, envisage that the principal effort in the air in case of definite Red military threat will have to be made by U.S. military aviation operating from bases in SEATO countries.

The delay likely to occur is worrying SEATO members who also realize the inadequacy of existing bases and the vulnerability of some of them to a well-planned Red attack.

The desirability of having more radar and similar equipment, also from the States, will be emphasized at the Canberra meeting.

Martin Switching Army's Lacrosse From Baltimore to Orlando Plant

Orlando, Fla.—Army will build its surface-to-surface missile, Lacrosse, at the new Orlando Division of the Glenn L. Martin Co.

Lacrosse (AW Feb. 4, p. 31), though well underway at Martin's Baltimore plant, will be phased soon to Martin's temporary facilities adjoining the Orlando Municipal Airport.

Construction of a huge 500,000 sq. ft. factory for Martin on a 7,400-acre tract south of Orlando, which the firm purchased last September, is slated to begin March 15. Completion is set for Oct. 1.

Approximately 3,500 persons will be employed at the main plant by Jan. 1, 1958.

'Temporary' Facilities

Martin has built nearly $400,000 worth of "temporary" facilities at the Orlando airport. It leased one 20,000 sq. ft. warehouse last November, and contracted to lease a second 20,000 sq. ft. building and a 25,000 sq. ft. building as soon as they were built.

Each of the new buildings cost $100,000.

Interior modifications, including a concrete stand for heavy machinery weighing several hundred tons, have been completed in one of the new buildings at a cost of $200,000. Blueprints for the remodeling show a network of overhead steel rails for moving Lacrosse airframes down the production line.

The Florida State Road Department is building a $364,000 highway four miles long through the middle of Martin's main plant site, located six miles South of Orlando. Clearing and grading of the factory site is slated to begin next week.

Architects and engineers for the factory are Conell, Pierce, Garland, Friedman and Associates, Miami. Martin will call for bids on the factory Feb. 18.

Contract Awarded

Another Miami firm already has been awarded a $480,000 contract to supply 1,100 tons of structural steel for the plant, to be erected on the site by July 1.

Martin also has contracted with the Orlando Utilities Commission for 20,000 kilowatts of electricity per year. The commission is building a temporary 12,000-volt power line to the site to supply power during construction. A 115,000-volt line now under construction will supply power after manufacturing operations start.

One of Martin's sub-contractors on Project Vanguard also is building a plant in Orlando. Aerojet-General Corp., Azusa, Calif., which is building the second-stage rocket engine for the Vanguard missile, has leased a 20-acre site near the Orlando airport and will build a 20,000 sq. ft. plant costing $125,000.

An Aerojet spokesman said in Orlando last week his firm would employ 1,000 persons in Orlando "within the next few years." Approximately 65 engineers are now working in Aerojet's new Florida Architect-Engineer Division in Orlando.

Piper Aircraft Plans New Florida Center

New York—Two moves have been made in the research and financial fields by Piper Aircraft Corp. The Lock Haven, Pa., firm is planning a 10,000-sq. ft. independent business and agricultural research center at Vero Beach Airport, on the Florida coast, and has changed its stock listing from the American to the New York Stock Exchange.

The new Vero Beach research and development center will work on future advanced business and agricultural aircraft design and stay entirely free from day-to-day engineering work at the home plant. Future project development has been hampered seriously in the past by engineering personnel being diverted to solve immediate problems as they occured on current aircraft.

Among important projects assigned to the new group will be development of a new agricultural airplane, probably using the PA-25/Ag-3 developed at Texas A&M Agricultural College by Fred Weick. According to industry reports, Weick is joining the Vero Beach group. An official announcement is expected from Piper of this development.

The Vero Beach center will probably also take on some production of Piper aircraft in the future, permitting the home plant to concentrate on the more complex Apache light twin and Comanche four-placer.

A minimum of Piper personnel is expected to be transferred to the new installation. It will report directly to Howard Piper, vice president-research and development. Vero Beach is a public airport covering some 40 acres, with six paved runways, the longest being, 7,500 ft. It is served by Eastern Airlines.

Piper's shift to the "big board" is largely a matter of prestige, though the New York Stock Exchange listing provides a wider market for trading in the company stock and might have value in the future if Piper should want to raise additional capital.

The new listing took effect last Monday, the day the market declined to its lowest point since 1955. Piper trading started at $19.75, but the price declined almost a dollar a share before the day was out.

Piper's progress, which has been rapid in the last two years, is credited to the Apache sales growth, and steady demand for the PA-22 Tri-Pacer and PA-18A agricultural model of the Super Cub. Apache sales began at 59 in 1954, rose to 415 last year.

French Study Atom Bomb Plans

Paris—French Defense Ministry circles have confirmed reports circulating in Paris that it has a plan under study which aims at construction of the atomic bomb.

It is understood the Defense Ministry is working on an atomic bomb project with the French Atomic Energy Commission. The latter agency refuses to confirm reports that France could explode an atomic bomb eighteen months from now if the government were to give a green light. Actual decision to construct the bomb has not been taken as yet by the government.

Official French policy toward atomic bomb construction was stated recently in the National Assembly by Premier Guy Mollet.

Mollet said his government had agreed to refrain from exploding such a weapon until 1961. Presumably this self imposed ban does not apply to studies leading up to the actual construction of the project.

French military circles have been eager to have atomic weapons of some sort ever since the Suez campaign where French policy had to be abandoned when threatened by Soviet atomic attack.

Many deputies complained of the lack of such weapons during the recent Assembly budget debate over defense funds.

Most observers agree there is at present a majority in the Assembly which would approve the construction of the atomic bomb, though at present the Socialist government is unlikely to push such a project.

Further French plans in this direction should be revealed within next few weeks when NATO's new five year atomic plan is presented to the Assembly.

DOUGLAS C-133A cargo loading plan aims to achieve airplane's theoretical ability to match ton-knot capability of 20 loaded freight cars operating between Los Angeles and New York.

Speedy Cargo Handling Built Into C-133

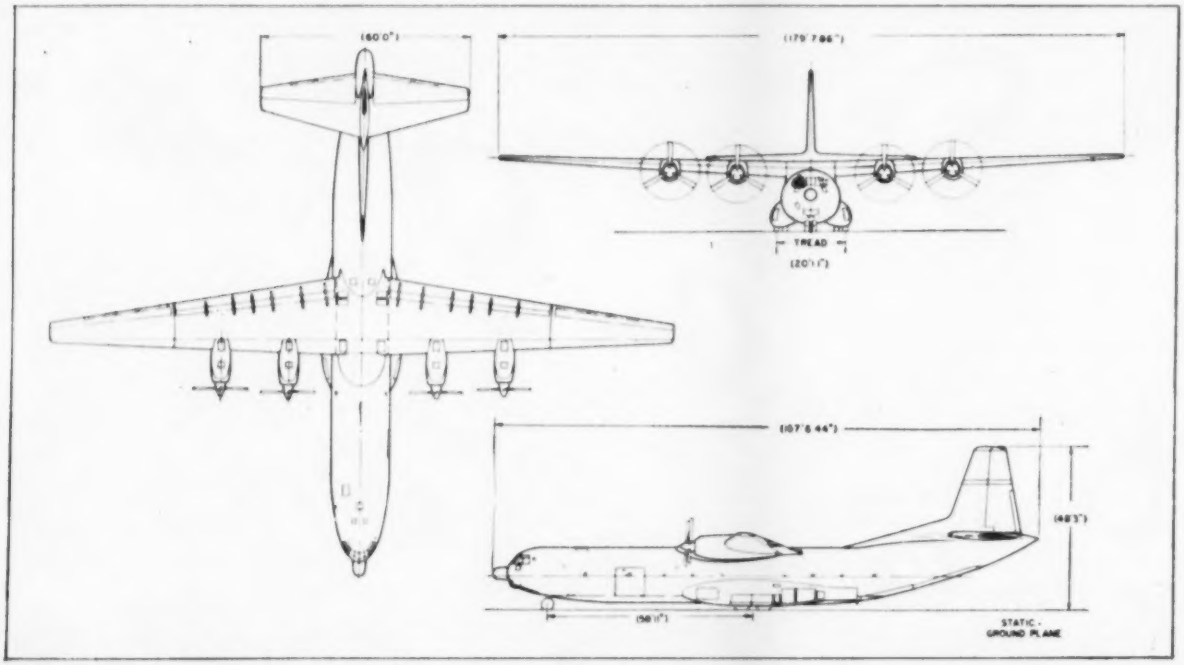
Long Beach, Calif.—Utilization rate for the Douglas C-133A turboprop transport is improved considerably with cargo handling techniques incorporated in the airplane design.

In a demonstration for MATS officers, a six-man crew using the Douglas technique loaded and secured a representative 67,000-lb. cargo in 40 minutes. This is a loading rate of 16,800 lb. per man hour.

The importance of fast cargo handling has been increased by rising aircraft speeds and cargo capacities. Loading rates have remained constant or increased because of the difficulty of loading and unloading aircraft which were designed without considering the cargo handling job.

The new technique is intended to capitalize to the fullest on the low cargo floor, large capacity design of the latest family of military transports.

The Douglas technique uses roller



PRODUCT of sound operations analysis, C-133A was designed with an eye to purposes and troubles of cargo carrier. Upswept tail permits ramp-door entry for heavy cargo. Cargo can also be loaded through forward door.

conveyors attached to studs which double as seat tie-downs in the troop carrying configuration and a loading dock of approximately the same height as the cargo floor. Cargo is pallet-mounted or bound to ½-in. or ¾-in. plywood panels. Heavy cargo is positioned by a winch in the forward end of the cabin. Barrier nets and hold-down nets are suspended by pulleys from the right sidewall and the ceiling and can easily be dropped over the loaded cargo and secured by snap hooks.

The short turnaround time made possible by the technique requires that loads be planned before the airplane reaches the loading dock to control center of gravity position and to allow for cargo off-loading at intermediate station. Eight-by-ten foot plywood panels serve as low cost pallets which can handle 10,000 lb. of small cargo items. A long cargo item may be placed on two or more panels and loaded as a single unit.

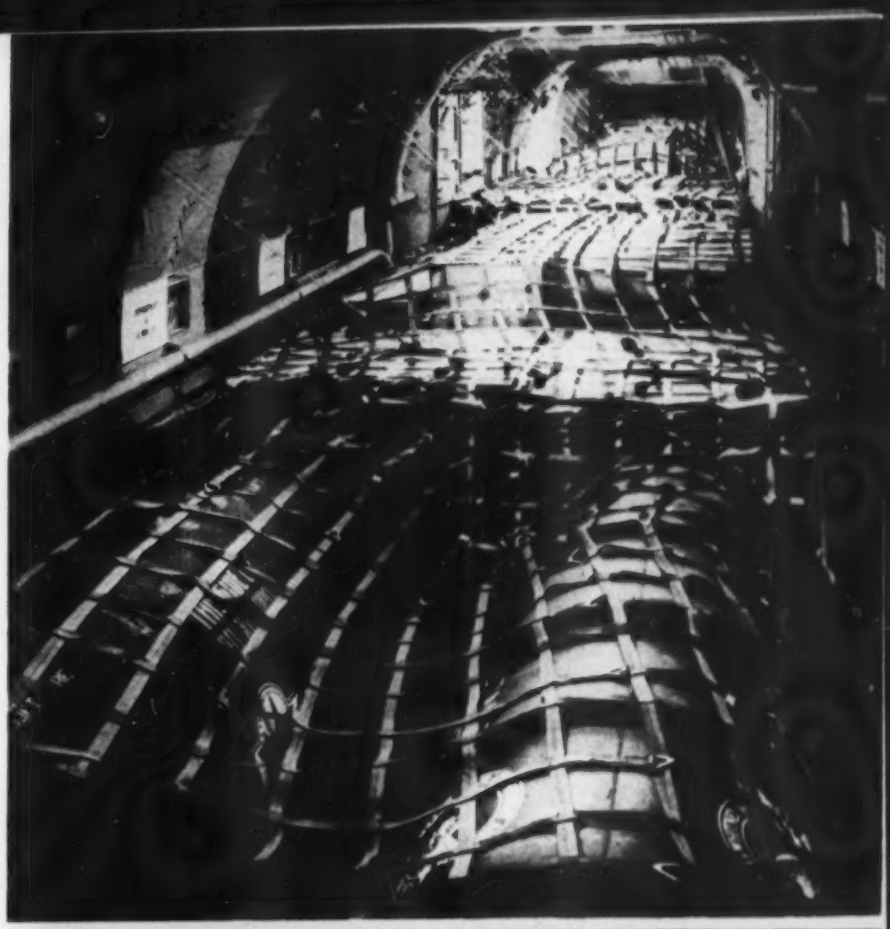
The conveyors may be installed to handle standard 40-in. x 48-in. MATS pallets. Pallets may be moved sidewise at the cabin entrance by mounting them on roller-borne transfer dollies (base equipment) or by installing the conveyors at an angle. The conveyor system consists of 52 ten-foot sections and two eight-foot sections. Four men can install the conveyor system in six minutes and remove it in four minutes.

Total tare weight of loading and tie-down equipment is 2,788 lb. The system is capable of handling a load of general cargo weighing 70,000 lb. A conveyor system using magnesium rails and plastic rollers is being studied which would cut the weight of the conveyor system from 1,288 lb. to 800 lb.

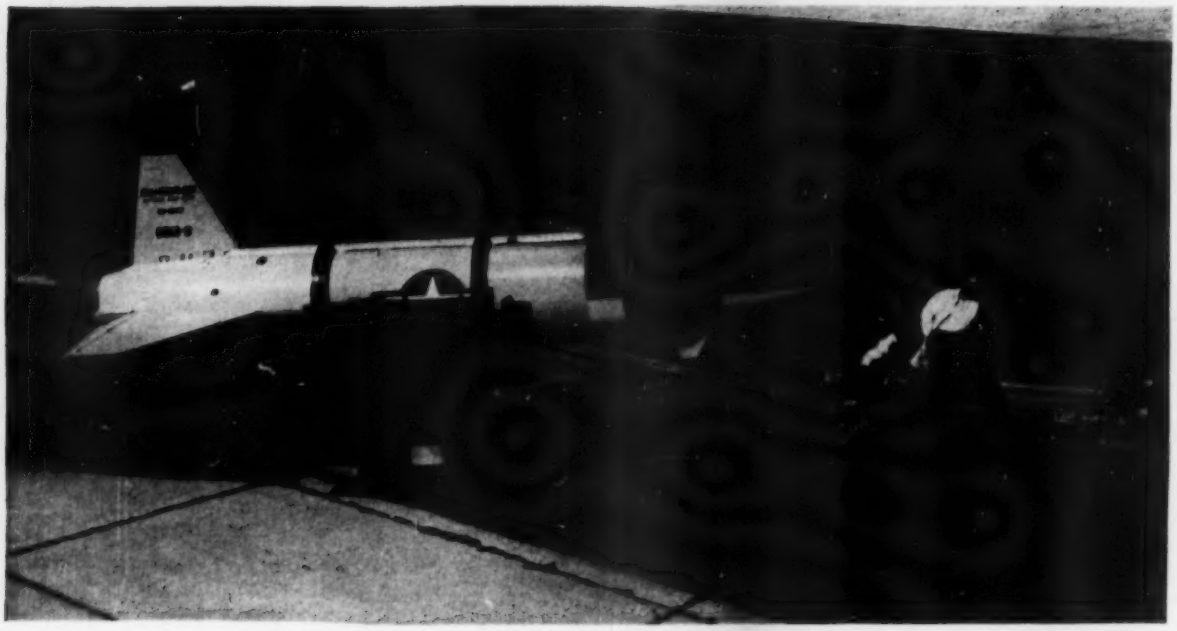
Width of a pallet load is limited to 120 in. and height is limited to 68 in. by the dimensions of the stern loading door. This allows 3 in. of clearance on all sides. A 100-in. x 106-in. forward cargo door makes it possible to load the airplane from both ends.

The net tie-down system consists of six barrier nets for forward and aft restraint and six hold-down webs to prevent vertical and lateral jostling. The barrier nets weigh 56 lb. apiece and will hold 16,000 lb. when extended to their full 110-in. height. When the cargo group is low enough to permit the barrier to be drawn back across its top, the barrier effectiveness is improved as it forms a catenary which divides the load between the floor fittings and the top lateral web. A cargo group weighing 21,500 lb. can be restrained in this way.

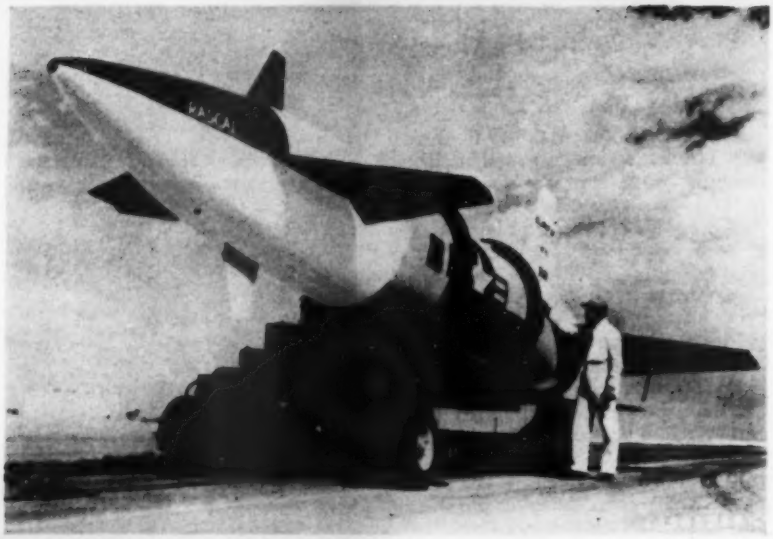
The ramp built into the aft loading door will support 25,000 lb. in the horizontal position. The hydraulic door actuator will lift the ramp from the ground with a 10,000 lb. load secured to it.

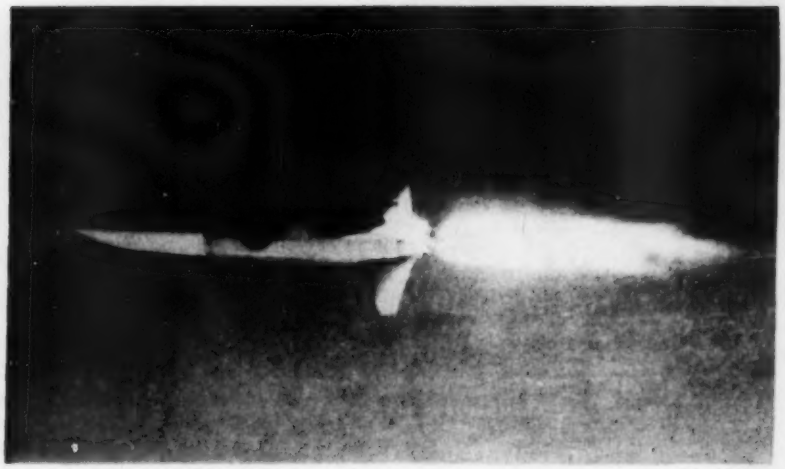


CARGO is quickly secured by few men in C-133A with barrier and hold-down webs suspended by pulleys from ceiling and right side which are dropped over cargo and attached to ring bolts in floor by snap hooks. Conveyor system allows heavy cargo to be winched aboard by small crew.



Bell Rascal On Carriers, In Flight





Bell GAM-63 Rascal air-to-surface pilotless bomber is mounted on carrier (above), which also is built by Bell. Three cylinders of rocket motor in vertical line are outlined in the in-flight photograph of the pilotless bomber (left). Rascal, with 100 mi. range, is designed to be dropped from bomber out of reach of enemy fighters (AW Feb. 4, p. 27). Speed of Rascal, which has both canard and conventional control surfaces, is about Mach 1.5. Lower fin aft has not been assembled to the vehicle mounted on the carrier. Bell Aircraft Corp., which also builds the liquid propellant rocket motor that uses acid-gasoline as a fuel, has received two recent contracts totaling more than $22 million for research and development work on the Rascal.

Cut out for provisions projectiles or platoons

The size of the load can be large and bulky, the destination just about anywhere, when the versatile Fairchild C-123 takes over in logistic or assault missions.

With muscle enough for 16,000-pound bulk loads, the C-123 airlifts just about any load. And, little more than a pasture is needed for its airfield. 700 feet for landing, and only a little more for takeoff. C-123's bring men and supplies in and out of short, rough, unprepared fields, landing at regular *eight second intervals.* Proof that any large scale airlift is quicker and surer in the versatile, rugged C-123.

Here is assault and logistics performance that actually improves on military requirements – another good example of the reliability and big job capability that Fairchild builds into its aircraft.

...WHERE THE FUTURE IS MEASURED IN LIGHT-YEARS!

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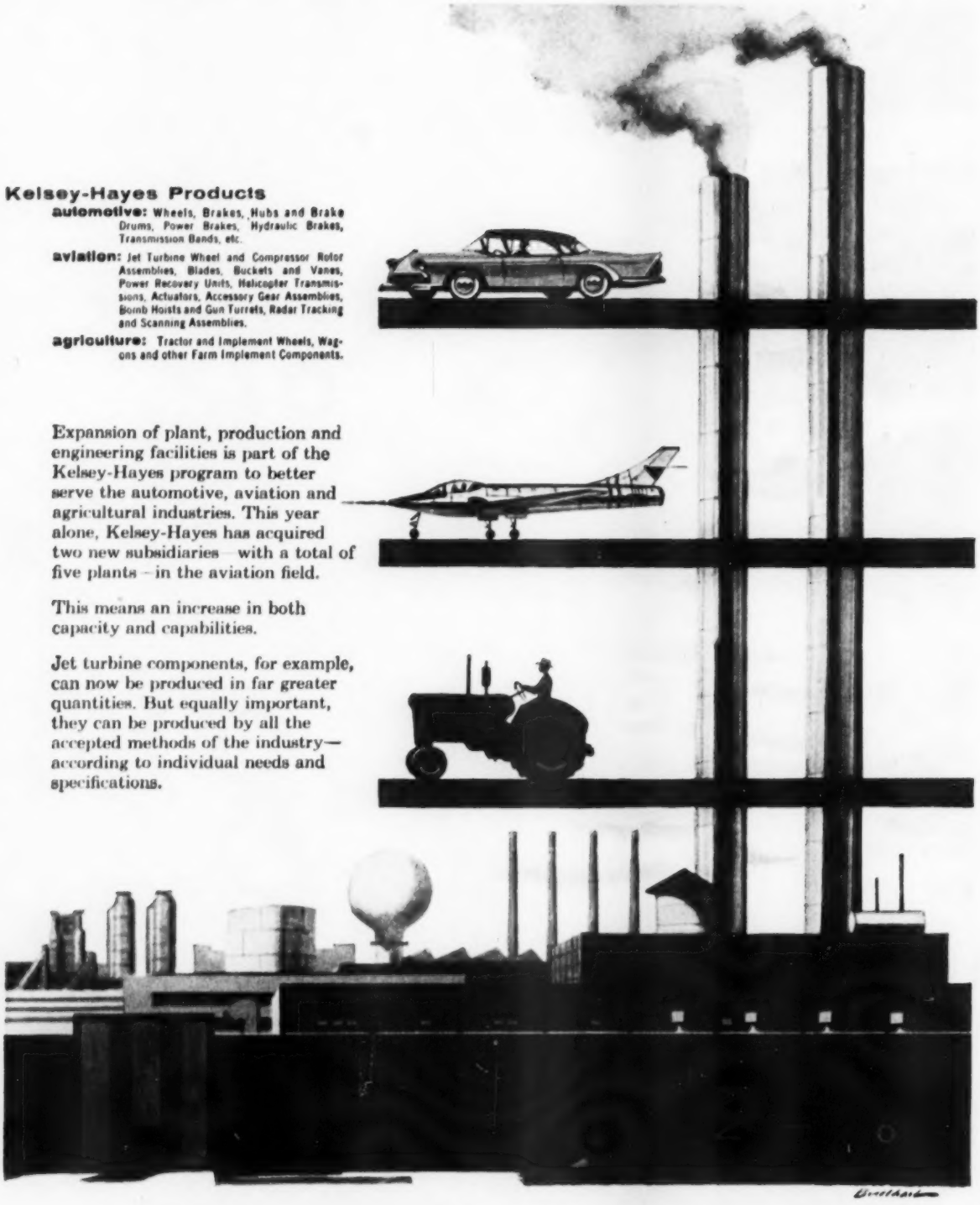


Kelsey-Hayes Products

automotive: Wheels, Brakes, Hubs and Brake Drums, Power Brakes, Hydraulic Brakes, Transmission Bands, etc.

aviation: Jet Turbine Wheel and Compressor Rotor Assemblies, Blades, Buckets and Vanes, Power Recovery Units, Helicopter Transmissions, Actuators, Accessory Gear Assemblies, Bomb Hoists and Gun Turrets, Radar Tracking and Scanning Assemblies.

agriculture: Tractor and Implement Wheels, Wagons and other Farm Implement Components.

Expansion of plant, production and engineering facilities is part of the Kelsey-Hayes program to better serve the automotive, aviation and agricultural industries. This year alone, Kelsey-Hayes has acquired two new subsidiaries—with a total of five plants—in the aviation field.

This means an increase in both capacity and capabilities.

Jet turbine components, for example, can now be produced in far greater quantities. But equally important, they can be produced by all the accepted methods of the industry—according to individual needs and specifications.

KELSEY-HAYES

Kelsey-Hayes Company, Detroit 32, Mich. • Major Supplier to the Automotive, Aviation and Agricultural Industries

15 PLANTS ***Automotive:*** *Detroit and Jackson, Michigan; McKeesport, Pa.; Los Angeles, Calif.; Windsor, Ontario, Canada* ***Aviation:*** *Jackson, Michigan; Springfield, Ohio — 2 plants — (SPECO Aviation Division); Utica, New York — 4 plants — (Utica Drop Forge and Tool Division)* • ***Agricultural:*** *Davenport, Iowa (French & Hecht Farm Implement and Wheel Division)*

Ion Propulsion

Washington—USAF's Office of Scientific Research disclosed last week that it has contracted for two small research projects to investigate the feasibility of ion propulsion for space flight.

The theory is that thrust can be generated by ejecting ions through a pipe after they have been energized by electricity in a vacuum.

USAF has invested $200,000 in basic research on the idea. German scientists have been working on the theory since before World War II. Recipient of the contract was not announced.

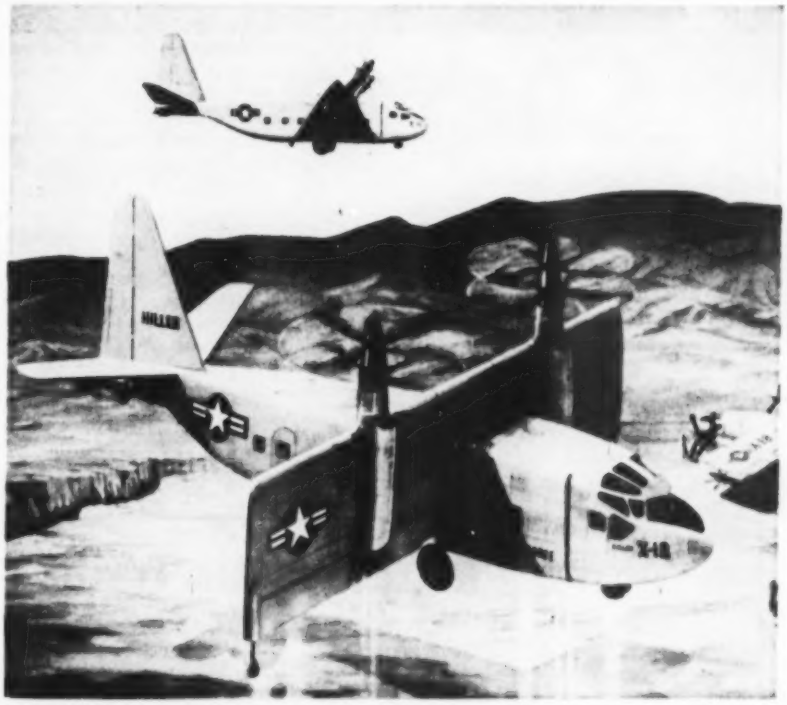
Hiller Awarded VTOL Contract

Baltimore, Md.—USAF's Air Research and Development Command has awarded a development contract to Hiller Helicopters to begin work on a tilt-wing VTOL design (see drawing below). Dollar value of the contract was not disclosed.

The Hiller X-18 will have four turboprop engines, each with two counter-rotating propellers. In addition, light turbojet engines will be mounted in the tail to provide control while the aircraft is in hovering flight.

Hiller contends the concept will provide higher forward speed but poorer hovering capabilities than the helicopter.

The X-18 will be a transport-size aircraft. Specifications were not announced, but Hiller is known to have plans for such an aircraft with a gross weight of 60,000 lb.



HILLER X-18 in artist's version demonstrates VTOL capability with wing in vertical position. At top, wing is in transitional phase from vertical to forward flight. Note light turbojet engine under tail surfaces.

News Digest

Glenn L. Martin Company's Denver Division awarded a $19.5 million missile instrumentation contract to Associated Missile Products Corp. of Pomona, Calif., subsidiary of American Machine & Foundry.

Air Materiel Command awarded General Electric's Technical Products Dept. a $4,594,095 contract for development, mockup and testing of a new single sideband tropospheric scatter system.

A composite squadron of 13 pilots is flying Chance Vought F8U-1 Crusader at Patuxent River Naval Air Test Center prior to fleet introduction. When pilot group has flown plane 600 hours, or program reaches eight weeks, F8U-1 will go on operational duty.

Air Materiel Command awarded a contract to Goodyear Aircraft to provide facilities for manufacture of missile guidance systems for TM-61B Matador. Company is working on earlier contract to produce an undisclosed number of the systems.

USAF contracts totaling more than $289 million have been awarded Convair Division recently. Included were $145 million for Atlas project; $70.2 million for F-106A program; $74 million for F-102A.

John von Neumann, Atomic Energy Commissioner and mathematician, died in Walter Reed Army Hospital, Washington, on Feb. 8 after a long illness. Neumann, 53, was appointed to the Atomic Energy Commission in 1954. He had served on USAF's Scientific Advisory Board; had been a consultant to the Armed Forces Special Weapons Project, the Army Ordnance Ballistics Research Laboratory. In 1956, he received the $50,000 Enrico Fermi Award from the U. S. government.

Regular quarterly dividend of 25 cents per share was declared by Boeing Airplane Company board of directors. The dividend is payable March 11 to stockholders of record as of the close of business Feb. 21.

USAF will activate 589th Tactical Missile Group equipped with Martin TM-61B Matador at Orlando AFB, Fla., about March 8. It will be the fifth Matador group formed. Three are stationed in Europe.

Safe Flight speed control equipment was installed in second F2H-3 by Royal Canadian Navy. Installation aids in carrier landing approaches utilizing mirror landing system.

Sikorsky HSS anti-submarine helicopter made its first flight powered by GE T58 gas turbine engine. Turbine-version HSS has slightly modified nose configuration permitting installation of two T58 engines, replacing one piston engine. T58 produces over 1,000 hp.

West German government has signed a contract for 26 Vertol H-21C helicopters. Deliveries will be made in 1957.

Thompson Products was awarded USAF contract for $4.3 million. Award involves continuance of Thompson overhaul, repair, etc., of turbo-alternator drives which it manufactures for the B-52 bomber.

First Army field test of its new streamlined "Pentomic" organization will be held in Louisiana March 27 to April 16. New 101st Airborne Division will take part. Name of the exercise is King Cole.

North Atlantic 1956 Traffic Gains 20%

Gain over 1955 was the largest actual increase the airlines have experienced on the North Atlantic.

By Glenn Garrison

New York—U. S. and foreign-flag airlines carried 785,000 passengers over the North Atlantic last year on their scheduled flights. The whopping 20% gain over 1955's total was the largest actual increase the airlines have experienced on the route and the greatest percentage increase since 1952 when tourist fares first went into effect.

The carriers offered 1,225,000 scheduled seats in 1956, some 22% more than in 1955. Overall load factor in both directions approximated 64%.

Another 46,000 passengers flew the North Atlantic in chartered planes of the scheduled airlines for a grand passenger total of 831,000 for the year. The charter traffic was up 16% over 1955.

Tourist traffic outstripped first-class at a rate of two and a half to one, highlighting the consistently increasing domination of the lower-fare market in filling transatlantic seats. Some 576,000 tourist class passengers were carried, while the first-class total was 209,000. Increases were 25% for the tourist, 10% for first-class over the previous year.

The above figures and most 1956 figures below are based on reported totals for the first 10 months of 1956, plus reliable estimates for November and December.

Other Developments

Other 1956 developments on the North Atlantic included:

- **Record summer** total of 380,265 passengers June through September. AVIATION WEEK predicted traffic for the period would near 400,000 (AW April 16, p. 122).
- **Emergence of the** mixed-class configuration as the new backbone of transatlantic scheduling. Shift to the practice of putting tourist and first-class passengers on the same airplane resulted in 70% increase in number of mixed flights during the year, while all-first-class schedules declined 20% and all-tourist flights decreased 2%.
- **Initial operation** of the new 17-day excursion fare, introduced in October, was inconclusive as to what the plan's effect on the market is likely to be. Low-rate immigrant fares, introduced in November, already are believed to have stepped up westbound loads considerably.
- **Seasonal and directional** imbalance still numbered among the carriers' big traffic problems on the Atlantic. Westbound passenger totals were up 25%, while the eastbound increase was only 15%.
- **Unsettled political** conditions following the Suez crisis last fall probably caused at least a temporary drop in advance bookings to Europe. The crisis has been a confusing factor to traffic analysts seeking to evaluate such developments as the new fares.

The 20% overall increase in 1956

North Atlantic Traffic—1956

Monthly Figures

	SCHEDULED OPERATIONS						CHARTERS	
	Eastbound			Westbound			Eastbound	Westbound
Passengers	First	Tourist	Total	First	Tourist	Total		
Jan	6,399	12,032	18,431	6,016	14,153	20,169	3,160	1,677
Feb	6,333	10,470	16,803	6,097	10,991	17,088	1,016	1,334
Mar	8,476	15,895	24,371	7,582	16,388	23,970	1,589	1,132
Apr	9,592	17,400	26,992	7,341	13,066	20,407	863	1,167
May	10,250	25,344	35,594	9,207	17,962	27,169	1,942	3,548
June	12,824	49,466	62,290	8,869	23,303	32,172	1,422	2,414
July	9,672	40,375	50,047	9,144	33,961	43,105	1,984	2,585
Aug	7,394	24,246	31,640	12,047	53,778	65,825	1,959	2,323
Sept	8,503	20,302	28,805	13,555	52,826	66,381	2,330	2,182
Oct	8,290	14,442	22,732	11,271	30,944	42,215	2,001	3,817
(Est.) Nov	7,000	12,400	19,400	9,500	26,100	35,600	700	2,200
(Est.) Dec	6,300	17,300	23,600	7,200	23,000	30,200	1,000	1,800
Total (Rounded Off)	101,000	260,000	361,000	108,000	316,000	424,000	20,000	26,000
1955 Total	94,615	219,283	313,898	95,063	243,296	338,359	16,416	23,127
% Increase	7%	19%	15%	14%	30%	25%	22%	12%

Totals—Both Directions

	First	Tourist	Scheduled Total	Charters	Grand Total
1956	209,000	576,000	785,000	46,000	831,000
1955	189,678	462,579	652,257	39,543	691,800
% Increase	10%	25%	20%	16%	20%

compares with an 18.5% rise in 1955, a 9% rise in 1954, a 17% rise in 1953, and a 32% rise in 1952, during which the tourist fare was introduced on the North Atlantic. Traffic during 1951, up 10% from the year before, totaled 329,656 scheduled passengers.

The transatlantic carriers operated 21,100 scheduled passenger flights during 1956, up from 18,006 the year before. Mixed flights accounted for 10,200 of the 1956 total. First-class flights totaled 4,000 and 6,900 all-tourist flights were made. Split in 1955 was 5,958 mixed, 5,000 first-class, and 7,048 tourist.

The 1956 seats available totaled 610,000 westbound, of which 445,000 were tourist and 165,000 first-class. Eastbound, there were 450,000 tourist and 165,000 first-class seats for a total of 615,000. In both directions, available tourist seats increased 25% and first-class seats increased 14%.

The directional imbalance of traffic which has been a problem on the North Atlantic for years continued last year with westbound traffic maintaining its lead over eastbound traffic. The airlines offered more eastbound than westbound seats in 1956, but carried more westbound passengers.

Load factor westbound averaged about 70%, while the eastbound load factor was 59%.

This directional imbalance is illustrated by a five-year comparison of passenger totals:

	Westbound	Eastbound
1952	231,469	200,803
1953	269,229	237,372
1954	288,498	261,502
1955	338,359	313,898
1956	424,000	361,000

Principal cause of the imbalance is considered to be the steady flow of immigrant traffic to the U.S. and Canada. New immigrant fare has helped fill off-season seats, but only westbound ones.

Excursion Fare

The 17-day excursion fare, which represented an International Air Transport Association compromise, still arouses scepticism among some IATA members as to its ticket-selling potential. Main objection is that two weeks is too short a time for the modern vacationer.

One airline official puts it this way: the average American vacationing in Europe spends five to six weeks there. To tap a really new, low-budget market among those with only two weeks off from their jobs it would be necessary to lower fares considerably more than the present plan has done. A sensible intermediate step, in this official's opinion, would be an excursion limit of about three weeks.

A leading travel agent agrees that two weeks is not enough time. But he believes it is too early to evaluate the possible effect of the 17-day fare. Many travel agencies, their programs made up early in the year, weren't set up to promote the plan last year, will do so in 1957.

The agent also considers the Middle East situation as having confused the travel picture late last year. It affected his business, which fell off in bookings for the coming season so that present levels are the same as at this time last year instead of higher as expected. Within the last two weeks, however, a strong increase has occurred. The agent expects an excellent 1957 and believes business will pile up suddenly and airline people will be looking for space to sell when the season is under way.

Travel Agent Tours

Travel agent tours are an increasingly important factor in the transatlantic business, according to Pan American World Airways. Pan American estimates that 50% of its business is derived from this source.

The airline carried 200,432 North Atlantic passengers last year, 134,243 in tourist-class and 66,189 first-class. Totals compare with 112,474 tourist and 57,836 first-class in 1955.

Pan American goes along with the "too short" criticism of the 17-day excursion, although finding some favorable effect so far from the plan. Pay-later business is a big item with Pan American, which reports excellent results from the credit sales and expects them to be an even more important source of 1957 business.

Trans World Airlines, proponent of the 17-day excursion, believes its effect cannot fairly be judged on the basis of this winter's traffic. The Middle East situation again is cited as an obscuring factor. TWA, while not considering the plan as necessarily the ultimate answer to finding new markets, does feel it has great potential and expects to push it strongly.

TWA's 1956 North Atlantic traffic totaled 133,410 passengers, only slightly up from 127,222 in 1955. Tourist traffic accounted for 107,014 of the 1956 total, up from 100,857 the year before; first-class traffic was 26,396 compared with 26,365 in 1955.

Examples of other individual 1956 results in North Atlantic business:

- **Air France** carried 58,531 passengers, up from 45,695 in 1955.
- **British Overseas Airways Corp.** carried 88,768 passengers, up from 74,279 in 1955. Last year's split was 53,878 tourist, 34,890 first-class. Totals for 1955 were 40,188 tourist, 34,091 first-class.
- **KLM Royal Dutch Airlines** figures, which do not include transatlantic traffic through Montreal, show a 55,000 total for 1956. This compares with 46,805 in 1955. The 1956 breakdown was 40,030 tourist, 14,970 first-class.
- **Scandinavian Airlines System** carried 50,070 passengers, up from 46,274 in 1955. Tourist total was 38,322, up from 35,229; first-class totaled 11,748, up from 11,045. SAS also handled 14,907 passengers on its West Coast-Europe polar route, not included in the above totals for the airline or for the overall traffic. The polar totals were 9,654 tourist, 5,253 first-class.
- **Swissair's 1956** total was 22,678 passengers, 16,804 of them tourist and 5,874 first-class. The airline carried 16,440 tourist and 5,726 first class passengers in 1955 for a total of 22,166.
- **El Al Israel** carried 7,261 passengers—all tourist—in 1956, compared with 7,204 tourist passengers in 1955.

Northeast Subsidy End Proposed by CAB

Washington—Civil Aeronautics Board has proposed the elimination of subsidy on all Northeast Airlines routes.

In announcing the proposed order, the Board said the action was based upon increased revenues from the New York-Florida route awarded Northeast last year and added:

"The route plays an important part in the self-sufficiency of Eastern and National. In selecting Northeast as the third certificated carrier to operate over the New York-Florida route, it was our judgment that the route would also eliminate Northeast's current subsidy need."

If the order is adopted, it will be the first time in Board history that all trunklines have operated free of subsidy. The action would deny Northeast more than $1.5 million subsidy annually.

The Board order calls for proceedings to establish a final mail rate for the airline and requires Northeast to show cause why subsidy should not be lifted.

The carrier may challenge the order by filing an objection. A complete answer with supporting documents must be submitted to the Board by Feb. 27 if Northeast wants to reserve its right to a hearing. During the route case, the CAB found that "Northeast's new system will compare favorably with those of other medium size trunks now operating without subsidy, and accordingly, it could be reasonably anticipated that it will also achieve self-sufficiency."

It added that during the route case proceedings, Northeast estimated that, on the basis of 1956 operations, it would have realized a 9.5% return after taxes from operations if it had had the Florida service.

CAA Says Commercial Aviation Will Dominate Transport Industry

Washington—Civil Aeronautics Administration predicted last week that commercial aviation will soon dominate the U.S. transport industry.

In a new booklet, "Civil Aviation and Federal Airways Forecast," the agency predicts a continued growth of every branch of air commerce and general aviation during the next 25 years and said "air commerce appears to be on the threshold of a new era of expansion."

The booklet predicts that 118 million domestic airline passengers will fly during 1970, 93 million by 1965 and 66 million by 1960. Last year, scheduled airlines carried 42 million passengers domestically.

CAA based its projections upon increases in the gross national product, national income, population and labor force. Growth factors considered in making the forecast were the large potential in number of air travelers, the general change of travel habits, downward trends in fare levels because of aircoach expansion and the introduction of faster, more comfortable jets.

In forecasting the future of international travel, the booklet noted the decline in fares and the inroads air travel made into ship travel during 1955 by carrying 66% of all overseas travelers.

U.S. scheduled airlines are expected to carry 11.5 million passengers by 1970 as compared with 4 million in 1956. The forecast says that by 1965 total number of international passengers will be 8.9 million and 6.2 million by 1960.

Air cargo is expected to climb from its 1956 level of 380 million ton-miles to 600-million ton-miles in 1960, one billion ton-miles in 1965 and 1.6 billion ton-miles in 1970.

The booklet says the trend in general aviation is toward rapid growth in business transportation, agricultural and industrial applications and charters.

It forecast that today's fleet of 62,000 general aviation aircraft will increase to 69,500 aircraft flying 11.8 million hours in 1960, 89,000 planes flying 15.3 million hours in 1965 and 108,000 flying 19.1 million hours in 1970.

The booklet reports that business flying has been growing faster than any other branch of general aviation and will continue to lead the parade. In this category, hours to be flown by 1970 are expected to reach 9.9 million.

Instruction flying has declined since the boom year of 1957, but CAA foresees an expansion of this type of flying during the next few years. The booklet said it is conceivable that civil operators may conduct flying training programs at the college level as a source of pilots for the military.

In 1955, instruction flying produced 1,275,000 hours. This is expected to expand to 1,300,000 in 1960, 1,531,000 in 1965 and 1,718,000 in 1970.

A modest increase in pleasure flying is forecast, following a decline between 1948 and 1952. Now on the upward trend since 1952, pleasure flying is expected to climb from almost two million hours in 1955 to slightly over 3.4 million hours in 1970.

Traffic forecasts indicate increase in the number of takeoffs and landings handled by CAA control towers from 14.8 million in 1956 to 22 million in 1960, 30 million in 1965 and 35 million by 1970.

Icelandic Electras

Reykjavik—Loftleidir Icelandic Airlines is completing negotiations for purchase of two to four Lockheed Electras. Contract may be signed this week if financing agreements between the Export-Import Bank and government of Iceland are wrapped up.

Delivery of the 80-passenger turboprops, which Loftleidir would use on its transatlantic route, is scheduled for 1959.

New Spanish Airline To Start Operations

Madrid—New Spanish domestic airline, Trabajos Aereos y Enlaces S.A., is scheduled to begin operations in March. The company initially will use a fleet of five 16-passenger Twin Pioneers and three 12-passenger Percival Hunting Co. Presidents.

Major objective of the new feeder line will be to provide service for American tourists in Spain. Arrangements have been made with tourist agencies for local ground transportation and sight-seeing facilities. TAE will operate scheduled and charter flights and will connect medium-sized cities not presently served by Iberia or Aviaco.

Future plans of the company include foreign schedules from Spain to Biarritz, Paris, London and Lisbon.

Two of the founders of the second largest Spanish airline, Aviacion y Comercio S.A. (Aviaco) are the prime movers in setting up the new company which includes in its organizing body representatives of several established Spanish tourist agencies and hotel organizations. Names of the board members have not yet been made public since final legal organization of the company will not be completed for several months. Authorization for the formation of the airline was given by the authorities on Oct. 17, 1956.

Douglas Estimates Future Airline Needs

London—Airlines of the world will require 5,900 turbojet and turboprop aircraft between now and 1970.

That estimate of the market came this week from Lord Douglas, chairman of British European Airways, in the Brancker Memorial Lecture.

In an analysis of the jet vs. turboprop controversy, the BEA chairman said the turboprop has a sound future in short and medium range service. He said its future in long-range operations may largely depend on whether it succeeds in establishing itself in service before the big jets appear on the scene.

He said the world's airlines will need between now and 1970: some 800 jets and 2,500 turboprops for short haul service, 700 jets and 800 turboprops for medium haul service, and 600 jets and 500 turboprops for long haul.

'Flexible Certificates' Asked by Smathers

Washington—Sen. George Smathers (D.-Fla.), a member of the Senate Commerce Aviation Subcommittee, urged Civil Aeronautics Board last week to grant "flexible certificates" that would permit scheduled airlines to shift operations to meet seasonal demands.

In a letter to CAB Chairman James Durfee, Smathers also recommended that supplemental carriers be granted seasonal certificates to assist in handling peak traffic.

The Senator said winter service into Florida is inadequate and added:

"The heavy demand for Florida service occurs at a different time of the year than does the heavy travel demand into the New England and far western areas. The air travel demand to Europe and Asia varies with the peak demand to Central and South America. The problem of meeting peak air travel demands in various sections is, more or less, the problem of making it possible for total available air travel facilities to be utilized in the areas where the peak travel demand occurs during the different times of the year."

A flexible system, he said, would avert an uneconomic solution under which air carriers have to maintain sufficient equipment to handle temporary heavy traffic on a year-around basis.

CAA Probes Airline Pilot Standards

By Katherine Johnsen

Wasington—"Nationwide study" of the qualifications of airline pilots has been started by the Civil Aeronautics Administration as a result of the crash of a Northeast Airlines plane after a takeoff from LaGuardia Airport involving 101 passengers (AW Feb. 11, p. 38).

This was reported to the House Commerce Aviation Subcommittee by CAA Administrator James Pyle, who ordered the investigation. He told House Commerce Aviation Subcommittee that "the first thing that struck me" upon reading preliminary accounts of the Northeast crash was that the pilot of the plane had been involved in two previous accidents.

Subcommittee Chairman Rep. Oren Harris (D.-Ark.) said he was concerned over whether the CAA is making adequate medical tests to determine physical weaknesses which would create "an accident proclivity."

An Air Line Pilots Assn. spokesman said last week that its subcommittee on professional standards has been working for over four years to improve pilot standards and has brought "numerous recommendations" to the attention of both the CAA and the Civil Aeronautics Board "which have not yet been acted on."

The House hearings on the Northeast crash and the earlier collision in the Los Angeles area of an Air Force F-89J fighter plane and a Douglas DC-7B, both on test flights, also indicates the mounting congressional concern over the problem of airspace allocation.

Pyle conceded that changes in the allocation of air space by the Air Coordinating Committee "are made slowly" since decisions must be by voluntary agreement of military and civil representatives.

Rep. John Moss (D.-Calif.) said he is sceptical of "the efficiency of military utilization" of the large area of airspace it has blocked off from civil use.

CAB Chairman James Durfee told the subcommittee that there has been little argument in ACC over military requests for air space since these are presented as being "dictated by the national security."

Durfee concurred with subcommittee members that matter "requires greater civilian attention."

CAA representatives told the congressmen that there are over 4,600 military test flights daily in the U.S., and that in the Los Angeles area, alone, there are upwards of 600 daily. Pyle said that the flights could not be diverted to ocean areas since "the whole Pacific Ocean has already been preempted by the military."

Subcommittee members also said they were concerned over whether airlines may be risking safety to gain traffic. The Northeast plane which crashed after takeoff from LaGuardia was scheduled to depart for Miami at 2:45 p.m. Testimony showed that between the scheduled takeoff time and the actual takeoff time of 6:01 p.m. approximately 20 additional passengers boarded the plane. (The plane was still 1,363 lbs. below its weight authorization.)

Afterwards, Rep. Harris said "there is no reason for herding a hundred people in on coach planes just as though they were animals—and treating them the same way."

Rep. Steven Derounian (R.-N. Y.) reported that at about 4:00 p.m. numerous passengers became "panicky" over the long wait, and that some wanted to leave the plane but were not permitted to do so. Rep. Harris said that, if this were so, "the denial of the right of passengers to get off . . . amounted to false imprisonment." CAA representatives also said Northeast "might be subject to liability" if this were the case.

Rep. Derounian said one witness to the crash, who has volunteered to testify under oath, gave this account:

At 2:15 p.m., the prospective witness arrived at the airport with his family, and the family boarded the plane. Snow was being swept off the plane's wings.

At 3:15, he was informed by an airline employee that "they are waiting for another plane from Boston" to make the flight to Miami.

At 4:00 p.m., he demanded that his wife and children be taken off the plane and was told that the aircraft "would leave in a few minutes."

At 4:45, the plane was taken to a hangar. He was then informed that this was "to repair ignition on the motor." At 5:25, he insisted again that his family be allowed to leave the plane and was told that it was "in flight." He said he learned of the crash, which occurred shortly after 6 p.m., over his car radio while en route home.

Rep. Harris said that, because of its equipment problem, Northeast was under pressure to keep its aircraft "continuously in operation." At present, Northeast has one DC-6B, in addition to the DC-6A which crashed near LaGuardia, with which to maintain its New York-Washington schedule. It is scheduled to receive nine additional DC-6Bs by the end of September and five Bristol Britannia turboprop transports during October and November.

Other developments at the hearings on the two plane crashes were:

• **CAB Chairman Durfee** said the main purpose of a new CAB regulation of Feb. 1 (AW Feb. 11, p. 38), spelling out stringent requirements for test flights over densely populated areas was publicity. Durfee said newspaper accounts of the California collision of the F-89J and the DC-7B failed to make "any reference to the fact that there were any existing rules whatever" governing test flights over populated areas. He added:

"This left the implication that the Board and CAA had been completely oblivious to this problem. The purpose of the Feb. 1 release was primarily to dispel any such idea. . . ."

• **Subcommittee members** discounted present methods of establishing restrictions over densely populated areas. CAA representatives testified that, although the DC-7B fell into a densely populated area, the collision might have occurred five miles outside the densely populated area. Rep. Robert Hale (R.-Me.) and other subcommittee members said the important factor is not the point at which a collision might occur in the air but the ground area that it might subject to damage.

• **Rep. Harris** criticized both the CAA and CAB for "a tendency to avoid fixing definite responsibility . . . . CAA and CAB are afraid they are going to hurt the feelings of someone and therefore endeavor to work around and finally come up with no fixed responsibility for anything."

CPA's DC-6Bs to Have Three Classes

Montreal—Canadian Pacific Airlines' transpolar DC-6Bs will be flying in triple-class configuration after April 1. Two new classes of fares—standard first-class and deluxe—are scheduled to go into effect at that time, and tourist passengers also will be accommodated on the mixed flights.

Seating style will distinguish between the standard first-class passenger, whose new Vancouver-Paris one-way fare will be $573.70 instead of the present $613.70, and the deluxe passenger, whose fare will be $623.70. Deluxe seats will recline fully and be fitted with leg rests, while standard first-class seats will recline 45 degrees and be without leg rests.

The airplanes will be laid out with 14 first-class seats aft, divided approximately six deluxe and eight standard first, in pairs. The planes carry 42 tourist passengers, plus either four additional tourists or two additional standard first-class passengers in small forward compartments. Berths also will be available on the mixed aircraft.

Important news for all corporate and private flyers...

Super Ventura and Beechcraft Bonanza

A new development for **all** types of aircraft engines

Here's a new detergent-type oil *for all types of aircraft engines*—whether they're horizontally opposed, inline or radial! It keeps all kinds of aircraft engines cleaner than was ever possible before with non-detergent oils . . . *without* developing any undesirable side effects.

The secret? New Gulfpride Aviation Series D combines Gulf's exclusive Alchlor Refining with a remarkable new "detergent additive."

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Experience in all kinds of service proves New Series D greatly *reduces carbon, coke and varnish collection* around rings and valve stems. *Eliminates harmful deposits* in the combustion chambers.

More hours between overhauls

New Series D offers you an unusually tough lubrication film, too. *Cuts down wear on engine parts substantially.* The result? Far lower *operating* and *maintenance* costs! Safer *engine performance!* Why not try it and see for yourself?

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AVIATION PRODUCTS

Airline Traffic—December 1956

	Revenue Passengers	Revenue Passenger Miles (000)	Load Factor	U. S. Mail	Express	Freight	Total Revenue Ton-Miles	Per Cent Revenue to Available Ton-Miles
DOMESTIC TRUNK								
American	564,261	371,972	64.60	2,252,796	1,027,068	7,202,270	47,187,811	61.27
Braniff	142,245	61,585	55.68	281,838	165,555	394,770	6,740,805	46.57
Capital	299,311	85,233	56.54	308,654	161,523	294,101	8,918,759	45.53
Continental	58,179	21,707	54.42	449,175	324,053	633,383	10,920,736	51.19
Delta	195,551	98,928	53.29	100,401	27,264	107,973	2,318,938	45.14
Eastern	621,550	338,999	54.91	1,301,924	496,905	1,437,207	38,513,263	43.86
National	118,639	88,803	54.21	424,948	82,698	456,960	9,491,242	54.92
Northeast	36,371	7,722	49.41	13,199	18,455	20,373	769,854	48.37
Trans World	329,487	278,187	61.08	1,526,320	993,846	2,181,082	31,339,857	57.03
Northwest	92,264	62,348	54.16	568,164	280,393	710,752	7,794,121	51.63
United	435,873	309,957	60.81	2,915,587	1,151,600	4,893,540	38,677,950	55.77
Western	96,408	48,528	59.26	339,123	102,222	204,420	5,285,437	55.75
INTERNATIONAL								
American	11,099	7,961	59.52	9,131	545	318,153	1,170,240	61.93
Braniff	2,992	6,439	52.58	35,320	.....	58,679	838,203	58.71
Caribbean-Atlantic	17,207	1,229	55.81	2,716	.....	3,743	117,267	53.59
Delta	4,837	5,622	60.95	7,564	.....	47,336	637,785	49.53
Eastern	21,776	28,811	62.20	106,127	.....	69,762	3,307,051	55.47
National	8,777	5,363	44.69	11,637	3,801	25,132	604,723	53.07
Northwest	8,453	16,825	50.12	1,609,146	22,505	616,505	4,120,868	71.91
Pan American								
Alaska	4,825	5,498	53.41	65,118	.....	240,901	883,112	50.95
Atlantic	63,845	94,346	62.20	1,911,048	.....	2,368,667	14,210,132	65.61
Pacific	25,309	78,088	71.17	1,704,489	.....	1,429,793	11,510,559	69.04
Latin America	106,672	105,931	61.71	579,589	.....	4,097,645	14,976,906	62.92
Panagra	11,998	15,961	64.13	82,695	.....	464,902	2,292,637	65.76
Trans World	16,235	42,987	58.52	1,384,487	.....	718,461	6,751,479	72.18
United	6,013	14,921	55.02	191,968	.....	82,136	1,818,797	52.96
LOCAL SERVICE								
Allegheny	24,841	4,197	37.30	12,963	19,985	10,050	443,522	40.13
Bonanza	10,354	2,296	43.18	5,523	2,594	6,929	234,127	42.23
Central	7,292	1,543	28.53	6,073	4,079	6,351	164,241	26.57
Frontier	15,540	4,550	47.81	148,507	7,550	50,567	641,822	70.43
Lake Central	8,596	1,349	36.39	2,568	.....	11,706	139,893	32.75
Mohawk	26,274	5,029	47.62	7,651	12,901	14,038	514,836	48.75
North Central	36,078	5,691	45.06	23,761‡	30,391	.....	596,720	41.34
Ozark	19,152	3,037	33.34	9,356	14,842	8,895	316,952	35.28
Piedmont	29,492	5,955	49.94	21,131	13,333	15,975	620,937	51.11
Southern	15,747	2,850	44.35	11,694	12,501	.....	297,138	42.68
Southwest	21,781	4,956	47.78	11,946	5,478	5,629	494,972	46.50
Trans Texas	18,382	4,279	38.68	20,363	10,077	22,160	460,622	36.43
West Coast	13,902	2,571	39.46	4,896	2,340	3,460	249,660	47.10
HAWAIIAN								
Hawaiian	33,190	4,480	55.00	9,005	.....	113,171	509,858	55.80
Trans Pacific	14,887	1,782	55.17	2,926	.....	12,916	157,419	58.70
CARGO LINES								
Aerovias Sud Americana	.....	.....	.....	.....	.....	751,064	751,064	70.80
Flying Tiger	7,151	23,192	99.15	52,588	64,067	5,975,675	8,401,469	81.41
Slick	.....	.....	.....	73,138	100,413	4,910,241	5,083,792	‡‡
Riddle*	.....	.....	.....	.....	.....	.....	.....	.....
Seaboard & Western	2,317	10,175	100.00	.....	.....	2,553,427	3,571,011	86.40
HELICOPTER								
New York Airways	3,371	62	30.69	1,135†	1,003	543	8,519	37.40
Los Angeles Airways	1,917	75	37.50	3,843	1,904	.....	12,742	49.32
Chicago Helicopter	447	7.15	34.94	2,157	.....	.....	30,246	37.30
ALASKAN								
Alaska Airline	5,183	2,345	39.78	69,804	.....	333,993	761,328	50.61
Alaska Coast	2,078	185	60.26	5,366	.....	3,679	27,801	66.70
Cordova	857	142	37.47	4,727	.....	16,151	35,574	43.75
Ellis Airlines	3,515	173	50.73	2,741	.....	2,559	22,949	67.61

* Not Available.
† Includes letter, parcel post & foreign mail transferred in bulk.
‡ Includes 7,385 ton miles of surface mail. ‡‡ Figure not available.

COMPACT TURBO POWER

for aircraft and non-aircraft use

The small gas turbine engine—whether powering vehicles, small aircraft, drones, helicopters or missiles—is rapidly developing into an efficient and trouble-free source of power. Its bantam weight makes it ideal as auxiliary power . . . for thrust assists in aircraft applications . . . and for such functions as control of the "boundary layer" (friction-held air on the wing surfaces of high speed aircraft).

At Curtiss-Wright's Turbomotor Division—which has augmented operations with new modern facilities at Princeton, New Jersey—engineers are expanding the potentials of turbo power, developing engines for both aircraft and non-aircraft uses. Their answers are contributing to the overall advancement of the science of propulsion . . . continuing Curtiss-Wright's leadership in every major airpower category of today and of the future.

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SHORTLINES

▶ **Aer Lingus** will add nearly 1,700 miles to its routes this summer when new schedules link Dublin with Dusseldorf, Brussels, Frankfurt, Zurich and Rome. The Irish airline will operate its new services with Viscount aircraft.

▶ **Slick Airways** flew 49,445,000 revenue ton-miles of cargo in 1956. Airline's January 1957 total of 4,375,148 revenue ton-miles represents a 45% increase over last January's figure.

▶ **Boom in Barbados** is reported by British Overseas Airways Corp. and British West Indian Airways, whose joint service between New York and the Caribbean resort experienced a 68% increase last month over the same month in 1956.

▶ **Friendship** for Australia has been ordered by Dept. of Civil Aviation for flight checking of navigation aids and airline pilots. The Fokker F-27 is scheduled for July 1959 delivery.

▶ **Mohawk Airlines** carried 28,507 passengers last month, 29.8% more than in January 1956.

▶ **Trans World Airlines** estimates 1,500 passengers a week will fly the West Coast-Europe polar route by 1958. . . . TWA is asking CAB to reverse examiner's recommendation that the airline be denied Seattle and Portland service on the route. Examiner recommended Los Angeles and San Francisco for TWA.

▶ **Panagra** is catering to the younger set with special meals for 5-to-12-year-olds on first-class flights. . . . Specialties include hamburgers and milk instead of hors d'oeuvres and champagne.

▶ **Chicago Helicopter Airways** carried 1,043 passengers last month. Carrier flew 1,919 customers during first ten weeks of passenger operation, inaugurated Nov. 12.

▶ **Canada** will spend $38,318,000 on airport construction jobs in the fiscal year beginning April 1. Biggest projects are at Montreal, Ottawa, Edmonton, Halifax, Gander, Winnipeg, Yellowknife, Aklavik and Williams Lake.

▶ **Meteor Air Transport, Inc.,** is buying two DC-4s and two C-46s from the Los Angeles Air Service for its passenger and cargo charter fleet.

▶ **Danish Prince Axel,** Prime Minister H. C. Hansen, will be aboard Scandinavian Airlines System's inaugural

AIRLINE OBSERVER

▶ Outlook is dim for any rein this year on the dwindling profit margins of the airlines. Expenses continue to climb, and a fuel tax increase to quiet growing demands for higher user charges may be introduced in Congress, adding to mounting costs that already are outstripping gross revenue gains. A fare raise is not likely until after the general passenger fare investigation is completed by the Civil Aeronautics Board despite a recent request by two trunklines for a six percent hike in fares (AW Feb. 11, p. 43). Purchases of new equipment will call for new financing at higher interest rates and the withholding of earnings, since fast amortization of new equipment for defense purposes probably will not be approved.

▶ **Canadian airlines want to hold fare rates at their current level but fear that any raise by U. S. carriers will force a similar increase by the Canadian companies. Trans-Canada President Gordon McGregor says: "The economies resulting from increased volume will offset the steadily rising labor and material costs."**

▶ Watch for a major sales breakthrough on the Convair 880 jet transport within the next 60 days. Domestic, European and Latin American airlines are involved.

▶ **Russia continues to donate transport aircraft to leaders of Asian nations in a move to spread Soviet influence and promote the sale of Russian aircraft in the Middle and Far East. Latest recipient of a luxury-type Il-14 is President Sukarno of Indonesia. Il-14s have been donated to Indian Prime Minister Pandit Nehru, Burmese Prime Minister U Nu and King Mohammed Zahir Shah of Afghanistan.**

▶ Northwest Airlines is replacing web-cotton seat belts with nylon belts on an attrition basis. Program will take about one year. New belts were chosen because of their durability, strength and ability to retain original color and gloss.

▶ **Domestic airlines recently opened five Joint Airlines Military Traffic Offices at military installations to bring the total of such units to 61. Last year, these offices handled more than 390,000 passengers.**

▶ Grover Loening, a director of Fairchild Engine and Airplane Corp., estimates that a 350 mph. cargo plane with a 35 mph. landing speed and a 20,000-lb. payload could be built in quantity and retail at about $300,000 each. Such an aircraft, he says, would put motor transport industry "out of business at its own price."

▶ **Western Air Lines has lost its motion in the general passenger fare investigation to quash a Civil Aeronautics Board subpoena directing it to produce studies and documents in support of loan agreements or commitments.**

▶ Civil Aeronautics Administration has let contracts for $36.5 million and is presently negotiating another $7.5 million of the $75 million appropriated for air navigation and electronic aids in Fiscal 1957.

▶ **Postmaster General Arthur Summerfield has called for an increase in postage rates to offset a postal deficit estimated at $651 million for Fiscal 1958. Deficit may be even higher if the railroads' request for a $150 million increase in mail hauling charges is granted. Summerfield says other costs such as employe fringe benefits, pay raises and modernization of facilities could soon bring postal deficit to one billion dollars a year.**

▶ Airline flying time between New York and Florida will be extended as a result of pilots' decision to follow coastal routes rather than the over-water cut-off corridor between Wilmington, N. C. and West Palm Beach. Pilots are wary of interceptor activity outside the corridor and claim air navigation facilities are not accurate enough to prevent unintentional wandering from the narrow band of unrestricted air space allotted to the airlines.

B52'S CIRCLE GLOBE NON-STOP IN

RIVERSIDE, Calif., Jan. 18—
Air Force Stratofortresses
day, a 45-hour 19
around-the-
Lady II, on the first non-stop
flight around the world in 1949.
The three B-52's streaked over
the March base runway

. . . and AVIEN gages made sure they had the fuel to do it!

Around the world in 45 hours at altitudes of 5 to 10 miles! To America and the rest of the world this was history in the making . . . a dramatic demonstration of the ability of our Air Force to strike any target on earth.

And it was still another demonstration of the superior dependability of Avien Fuel Management Systems under the most rigorous service conditions. Standard equipment on the B52's . . . as well as in the IFR system of the KC97's that refueled them in flight . . . the Avien fuel gages provided the mission's crews with assured control of fuel supplies throughout the 24,000-mile flight.

Wherever modern flight is thrusting toward new frontiers, Avien instrument systems are serving important jobs . . . providing the accuracy and reliability demanded by today's and tomorrow's aircraft.

Today Avien Fuel Gages, Engine Temperature Gages, and Fuel Flowmeters are in service on some 80 types of Air Force and Navy planes. Other Avien instruments will soon be operational on advanced aircraft now moving into production.

Whether for global bombers, Mach 2 fighters or missiles, the chances are that Avien's experience in designing and building precision instrument systems can help you meet the most critical requirements for control and measurement of fuel quantity, fuel flow or engine temperatures. Why not talk over your requirements with your Avien representative? Avien, Inc., 58-15 Northern Blvd., Woodside 77, N. Y.

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Europe-Japan transpolar flight leaving Copenhagen Feb. 24.

▶ **Pacific Northern Airlines** dedicated its new passenger terminal building at Cordova, Alaska, last week, which also saw the inauguration of twice weekly DC-3 service to Dillingham.

▶ **Direct air service** between Melbourne, Australia, and Auckland, New Zealand, was started early this month by Tasman Empire Airways Limited (TEAL).

▶ **Panagra** reports an increase of 51% in its air cargo operations over 1955. Airline flew 3,966,900 revenue cargo ton-miles over routes in seven South American countries compared to 2,634,100 in 1955.

▶ **TWA** will consolidate crew training in the former Robert Keith Furniture Building in downtown Kansas City by late spring. Training will include latest flight simulators.

▶ **American Airlines** customers can now get tickets and reservations through Southern Pacific offices in 200 western communities formerly without AA representation. Railroad effected a similar agreement with United Air Lines last fall.

▶ **Lufthansa** will add two routes to its European services: Frankfurt-Stuttgart-Zurich daily effective April 14, and Frankfurt-Munich-Vienna daily effective April 28. Convair 440 Metropolitans will be used on both runs.

Senate Confirms Pyle, New Deputy Named

Washington—The Senate last week confirmed the nomination of James T. Pyle as Administrator of Civil Aeronautics by a unanimous voice vote. Pyle already had been confirmed by the Senate Commerce Committee. After his official confirmation, Pyle announced the appointment of William B. Davis as deputy administrator. Davis has been director of the CAA office of flight operations and airworthiness and its predecessor office of aviation safety since November 1955.

East Germany Builds Soviet Il-14 Transport

Bonn—The East German aircraft industry will show their first product that has been built on license—the Soviet transport and passenger plane, the Il-14—at the Leipzig Fair March 3-14. It has room for 26 passengers. It is said that the East German aircraft industry is already working on construction of a jet passenger-plane.

The Airport Problem

For some years the Washington, D. C. area, comprising Maryland, Virginia and the District of Columbia, has been in the midst of an airport battle. Except for the fact that the controversy is in the nation's capital, and is therefore argued in Congress and various government departments, the events are typical of most metropolitan areas. There are people who want a new airport, people who don't and many who want it someplace else.

The whole thing started for the usual reason—overcrowding at National Airport. Can you name a major field that isn't? The other reason was that National is too small for large jet operations and cannot be expanded. So the search was on.

Best Site in Maryland

Topographically the best site was in Maryland—on the site occupied by Andrews Air Force Base. The use of Baltimore's Friendship Airport was considered too distant to adequately serve the capital. The only other possibility was in Virginia, at a crossroads called Burke, and the government began the land buying.

For a number of reasons the acquisition of the required 4,500-odd acres has so far amounted to about one-tenth of this figure in scattered parcels. And there it sits while the matter continues in debate. If all controversy ended tomorrow it would still take many years to place a useable field at Burke. Meanwhile the Citizens Committee For Burke, and the Citizens Committee Against Burke, and all the other committees up through Congress seem to be getting further from agreement. Now what?

It seems that aviation has reached a point where it must pull together as a single working group. Not only for preserving airports but to promote all aeronautical things. Individually the various aviation organizations have appeared before such bodies as the Airport Use Committee, the President's Air Facilities Planning Group, etc. and each has put forth its case. But that seems to be the trouble. Each group apparently spends most of its time rebutting the arguments and plans of others and no one makes much headway. A united effort might accomplish more.

People inside aviation sometimes take the business too much for granted and tend to forget that it must be "cold." The public may not view an airport with quite the same reverence that a pilot does. Average citizens may balk at the prospect of "dangerous overcrowded conditions" and the "noise nuisance" being built in his section of town.

Aviation Segments All Vital

There is little sense in trying to rate one branch of flying above another. Each type, airline, business, military and private is a vital part of the air power and economy of the country. Each has its own requirements besides having many mutual problems. And each area of the country should have adequate facilities for each group. Sometimes these facilities can be shared, sometimes they should be separate and distinct, sometimes multiple facilities must be provided.

Our present airport situation is almost as bad as our traffic control. Many metropolitan areas are practically devoid of suitable fields for private flyers. The two busiest airline terminals in the world are also two of the worst. Lots of business pilots have to contend with 3,000 ft. mud strips and I rather imagine the military people are not too happy about some of their locations.

There is one great common bond between these groups—all must share the same airspace. Is it not possible to obtain more mutual effort—not only on airports—but on all aeronautical matters? Continuing to fight divided only prolongs the agony.

SCHEDULED TO ENTER COMMERCIAL SERVICE IN 1960, the General Electric CJ-805 will have a guaranteed maximum parts cost of $22/flying hr/engine in fleet operation.* First applications: TWA and Delta Air Lines' new fleets of Convair Model 880's.

*For two-year period after initial airplane delivery.

makes possible the ideal medium-range jetliner

General Electric CJ-805 Simplifies Jet Transport Maintenance Six Ways

Swift, low-cost engine maintenance—essential to better customer service and greater airline profits—is provided with General Electric's new CJ-805. Based on J47 experience, it is estimated the CJ-805 will require only 750 man-hours to overhaul; .5 man-hours of line maintenance per engine flying hour. The engine has six key design features that help simplify maintenance.

1. **Single-rotor** design simplifies engine upkeep and repair.
2. **Only three main bearings** make possible faster assembly and disassembly, require less service time in seating precision parts.
3. **Split compressor, combustion and turbine casings** permit quick inspection of rotor and stator blading and combustors.
4. **Externally-mounted engine controls** are readily accessible, quickly serviced.
5. **Three-stage turbine rotor can be removed as one piece.**
6. **All-steel rotor construction and low blade-tip-speed** minimize foreign object damage.

For more information on how the CJ-805 can benefit your airline, contact your G-E Aircraft Engine Specialist. You can reach him via your nearest G-E Aviation & Defense Industries Sales Office. *General Electric Company, Cincinnati 15, Ohio.* 237-9

PRODUCTION CAPACITY OF GENERAL ELECTRIC will help make possible "on-time" CJ-805 delivery. Since 1941, when company built America's first turbojet, G.E. has produced more than 31,000 turbojets.

COMPREHENSIVE CJ-805 DATA AVAILABLE to all qualified airlines. For more facts on why the 10,000-lb-thrust-class CJ-805 makes possible the ideal medium-range jetliner, contact a G-E Aircraft Engine Specialist.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Bogota's New International Airport Will Be Ready in Late 1958

Bogota—Bogota's new International Airport is scheduled to be ready for traffic in the second half of 1958. It will be able to handle the heaviest equipment in the air, be it Douglas DC-8, Boeing 707, or whatever.

Colombia has set its pride in getting the very best for its capital which lies on the direct line from New York to Buenos Aires.

The airport, only about 10 minutes' driving time from the central part of Bogota, has been designed by Empresa Colombiana de Aerodromos, an autonomous government agency. The Colombian engineering firm Pardo Restrepo & Santamaria started laying concrete pavement on the runway at the end of last month.

Empresa Colombiana de Aerodromos (ECA) is under the direction of Colonel Jorge Tellez, the chief engineer is Hernando Garcia Lasso and chief of design, Ernesto Sarria. Technical assistance is given by Dr. Pietro Vigna of Civil Aeronautics Administration, Airport Division, Washington, under an ICA contract.

The field has been located in such a way that it can be used in any weather, but at this altitude, 8,600 feet above sea level, maximum weight for DC-8 and 707 aircraft will be a gross load of 270,000 lbs.

The airfield is eight miles west of Bogota between Fontibon and Engativa communities and will be reached over a new highway under construction that will be almost 200 ft. wide.

Only one runway will be constructed for the time being. A second one is, however, in the design stage on the other side of the terminal building, exactly symmetrical to the one under construction.

The runway is 3,800 meters (12,350 ft.) long and 60 meters (200 ft.) wide. The taxiway of the same length as the runway, but with the additional taxiways to the runway totaling 4,000 meters (13,120 ft.) long is 30 meters (100 ft.) wide and runway and taxiway have a clearance from the central axis of 210 meters (700 ft.). The warming platform at both ends of the runway measures 15,000 sq. meters and is large enough for eight Super Connies warming up at one time.

Runway Surface

Surfacing of the runway is done with concrete that has a thickness of 13 in. at both ends of the runway for a length of 250 meters (830 ft.). The rest of the runway has a concrete capping of 11 in. The surface consists of 20 ft. x 20 ft. slabs with expansion joints each 1,300 ft. The surfacing of the taxiway consists also of concrete slabs 13 in. thick with the same disposition of joints. The surface of the apron also consists of 13 in. thick concrete and covers an area of 280,000 sq. meters.

Drainage of the field required open ditches 30,000 yards long with culverts of diameters of 60 in. and 72 in. The underground drainage extends over a length of 20,000 ft. There are 39 catch basins installed. The runway and taxiways as well as the apron are built on a water-bound macadam base of 16 in. thickness.

Terminal Layout

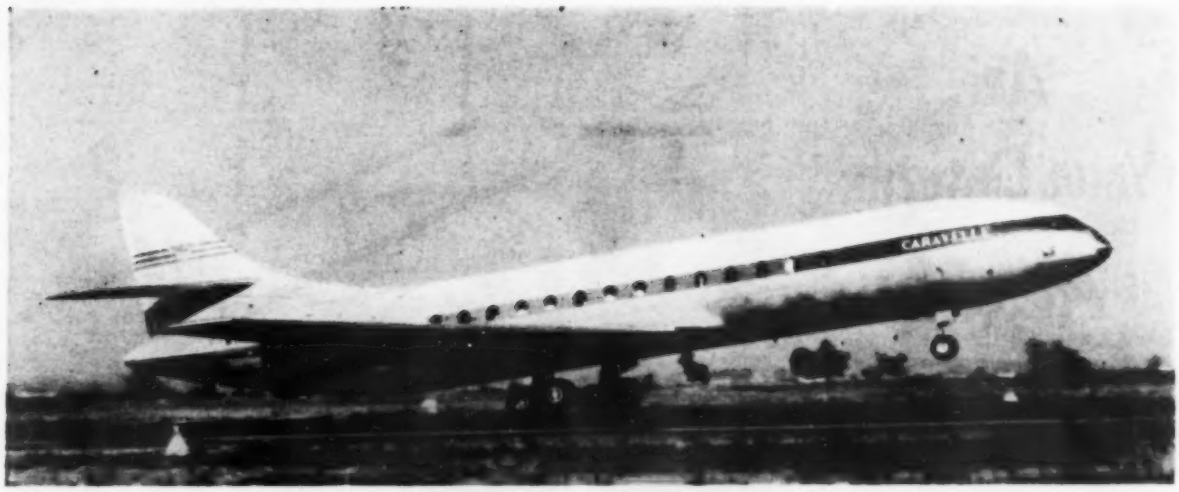
The passenger terminal has been designed in its general layout by Steward & Skinner, Architects, Miami, Florida. structural design and mechanical engineering were done by the Bogota firm of Cuellar Serrano Gomez & Cia. Ltd. The tender for the construction of the building is still open. The total floor area of the building measures 32,000 sq. meters. It is provided with fingers 160 meters (530 ft.) long that will allow 16 aircraft to be stationed there at a time. The cargo terminal has a floor area of 2,500 sq. meters.

There will be three large hangars: one for 2 DC-8s and another for smaller aircraft owned by Avianca, Colombia's largest carrier. Other carriers have not yet decided on their requirements. The third hangar will be used by the government for its own aircraft.

The new airport will be provided with complete navigation facilities: ILS and radar. High intensity lighting will be used for the runway, the approaches and taxiways will use standard lighting.

San Juan Airport Expansion

Only a year and a half old, San Juan International Airport in Puerto Rico will be expanded to provide a run-up apron for jet takeoffs, 50% increase in passenger arrival area and cargo buildings, installation of four additional outbound loading positions, and widening of taxiways. Airport hotel, large white building in center of picture, will double its capacity by May 1, when it will have 55 rooms. Terminal facilities are on bottom floors of hotel. The airport, a $15 million construction, handled 686,511 tourists and businessmen in Fiscal 1956, an increase of 30% over Fiscal 1955. Government estimates air cargo shipment rate of increase about 12% over last year.



Caravelle on Takeoff

Caravelle French twin-jet shown here on takeoff will tour three North American countries this spring in attempt to find additional customers. Scheduled to begin in April, flights will be made to about 16 U. S. cities and Air Force bases, will follow airline routes. Prototype Caravelle has logged 1,000 hours, according to Sud-Est Aviation. Only Air France so far has ordered the 470-mph. plane, with commitment for 12 aircraft and option on 12 more. Sud-Est and Ouest Aviation plan merger March 1 (AW Jan. 14, p. 28) under name of Sud Aviation. Manufacturer claims seat-mile cost of 1.25 cents on medium-range routes for the 80 passenger turbojet.

Czechs Reveal New Details on Aero-45

Czechoslovakia's twin-engine, four-place Aero-45 is being assigned a jack-of-all-trades role in Russia's European satellite empire.

Wearing either civil or military markings, the low-wing, metal monoplane is turning up with increased frequency at Iron Curtain airports. Besides widespread use as an air taxi, the craft is employed on short-haul cargo-mail runs and as a trainer.

The Aero-45 is powered by two Walter Minor four-cylinder engines with rated capacities of 105 hp. at 2,500 rpm.

Cruise rating for the engine is 80 hp. at 2,300 rpm.

The aircraft can be equipped with wheels, floats or skis for operation in any part of Eastern Europe. While ordinarily carrying a pilot and three passengers, the passenger seats are easily removable to provide additional cargo space.

With seats in place, the baggage compartment volume is 13.8 cu. ft.

Official performance figures for the Aero-45, long withheld by Communist censorship, reveal that with a gross weight of 3,087 lb., a 911-lb. payload and 313 lb. of fuel the ship has a normal range of 528 miles.

Maximum range with a gross weight of 3,307 lb., an 878-lb. payload and 534 lb. of fuel is 931 mi.

Fuel consumption at cruising speed "doesn't exceed 20.5 liters per 100 kilometers of flight" (approximately 11.5 miles per gallon), according to Communist reports.

With a 3,087-lb. gross, the Aero-45 has a top speed of 177 mph. Cruising speed is 152 mph., and landing speed is just under 50 mph. Practical ceiling is about 18,700 ft., with an altitude of 4,920 ft. possible on one engine. Rate of climb is 984 ft. per minute. Takeoff run is 640 ft.; and landing run, using flaps and brakes, is 623 ft.

Dimensions for the Aero-45 are: wing span 40 ft. 4 in., height 7 ft. 6 in., and length 24 ft. 7 in. The cabin is 74 in. by 44 in. by 46 in. The left side of the clear canopy swing upward.

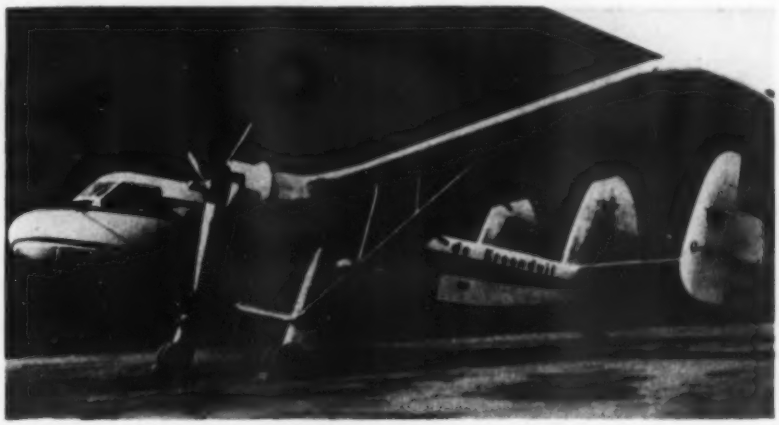
Ethiopian Uses Loan To Buy Two DC-6s

Cairo, Egypt—Ethiopian Airlines has announced the purchase of two Douglas DC-6B airliners and the option to buy a third.

The new aircraft will be delivered in the spring of 1958.

Purchase of the planes was financed as part of a $24 million credit established by the Export-Import Bank of Washington to foster expansion of Ethiopian aviation.

Ethiopian Airlines, owned by the



KLM Pioneer

One of three Scottish Aviation Twin Pioneers ordered by KLM Royal Dutch Airlines for its New Guinea subsidiary shown in new paint scheme. Proper name of subsidiary is Nederlands Niewuw Guinea Luchvaart Maatschappij, N. V. de Kroonduif, only latter part of which is used on the aircraft. The 16-passenger twin-engined airplane is capable of 100 yard takeoffs.

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Push Button Control

Push button control of motorized passenger loading stand, introduced by United Air Lines at Los Angeles International Airport, is believed first such unit of its kind. Four buttons can be seen between hands of Jack Lowe, ramp supervisor at Los Angeles airport, which actuate electric motors providing speed of two miles an hour; raise or lower stairway platform to desired height.

Ethiopian government, is managed and operated by Trans World Airlines.

The funds will be used in this way: to purchase latest type aircraft and improve maintenance and operations facilities; extend runways and install lighting at Addis Ababa Airport and improve Ethiopia's 22 other airports; survey establishment of additional airports; study possible use of helicopters on domestic routes.

EAL's new DC-6B airliners will operate on routes between Athens, Addis Ababa, and Nairobi. They are designed to carry both tourist and first-class passengers.

Interiors of the aircraft will be in futuristic styling.

The DC-6Bs will joint EAL's fleet that consists of DC-3s and three Convair 240 aircraft.

Canadian Firm to Make Simulator

Montreal—Canadian Aviation Electronics Ltd., Montreal, has received an order to manufacture a CAE DC-6B flight simulator for Canadian Pacific Airlines.

It is the first full simulator to be contracted for by a Canadian airline, and the first commercial model to be built in Canada.

This commercial contract—understood to be for $755,000—follows completion by CAE of the CF-100 flight and weapons systems simulator prototype for the Royal Canadian Air Force. The latter order represented the largest single electronics development contract let by the Canadian government. The

Observe the resourceful little prickly pear cactus. Tempting, green and juicy, it blossoms unmolested and thrives uneaten on the hungry, arid desert, because it has the good sense to be prickly first and succulent second. Some say you must eat or be eaten in this world. There is a third way to live. Keep some stickers showing and you, too, can take time to grow flowers. Republic makes a very efficient brand of stickers . . . they're called THUNDER-CRAFT.

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West Germany orders 26 H-21 helicopters for its defense forces

With its order for 26 H-21 helicopters West Germany became the fourth NATO nation to acknowledge the ability of Vertol's Work Horse to do the heavy lifting and hauling that cannot be accomplished by any other vehicle.

In the far north, beyond the range of trucks and trains, H-21's are prime movers in construction of early warning sites. For the Canadian, French and U.S. military services across the world, H-21's have flown scores of thousands of hours in high performance missions. Rugged, reliable, independent of prepared landing fields, they draw the assignments no other vehicles can handle.

The H-21 or its civilian counterpart, the Vertol Model 43, can lift 20 men or 2½ tons of cargo. It is the only available helicopter capable of towing land or sea vehicles safely and satisfactorily. Tandem rotors eliminate problems of load placement because of the large permissible travel from the center of gravity.

In the logistics of peace or war, the Vertol H-21 is a key to the missions too difficult for surface vehicles and airplanes.

In defense, in industry, Vertol helicopters set the pace. Theirs are Skyways without Runways.

Engineers, join Vertol's advanced engineering team!

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first of eleven production models of the simulator is at present undergoing acceptance tests.

Working from basic Curtiss-Wright patents, CAE's development group achieved a new order in precision simulation, especially as regards radar fire control, the automatic firing system which controls the armament of the CF-100.

This achievement of CAE—as a wholly-Canadian-owned company in a new and intricate field of electronic engineering—has permitted CPA to place the DC-6B simulator order with a Canadian simulator facility.

Construction of the CPA simulator will take place in CAE's 130,000 sq. ft. main plant on Cote de Liesse Road in Montreal.

It is to be installed in a special training center at CPA's Vancouver Airport headquarters and will allow for a 50% increase in effective training time for all CPA flight crews.

Japan Airlines Plans Route Expansion

San Francisco—Within ten years Japan Air Lines intends to expand its present international routes from Bangkok-San Francisco run to a network circling the globe.

Yoshito Kojima, vice president of JAL's American region, says an extensive study is underway to determine specific personnel and equipment requirements and to plot organizational and logistical needs.

The plans include Douglas DC-8 jet transports, used in combination with DC-7Cs, DC-6Bs and DC-4s. Thirty-three airplanes, more than double JAL's present fleet, will be used.

First step of the ten-year plan will be to increase the number of trans-pacific flights from four to five this spring. Inauguration of DC-7C service will begin early in 1958, with trans-pacific flights being increased to six to include Los Angeles.

Sabena Buys Cessnas, Burmese Get Model 180s

Wichita—Eight twin-engine Cessna 310s will be delivered to Sabena Belgian Air Lines later this year. Five of the light twins will be used by the parent company in Brussels as instrument trainers; the remaining three are going to the Belgian Congo for Sabena's affiliate, Sobelair, equipped to handle stretchers, cargo and personnel.

Ten single-engine Model 180s are being shipped to the Burmese Air Force for utilization in patrol, liaison and observation work.

Value of the contract exceeded $250,000.

Cessna notes that this is the first order by the Burmese government for U. S.-manufactured aircraft, previous purchases being made through the United Kingdom.

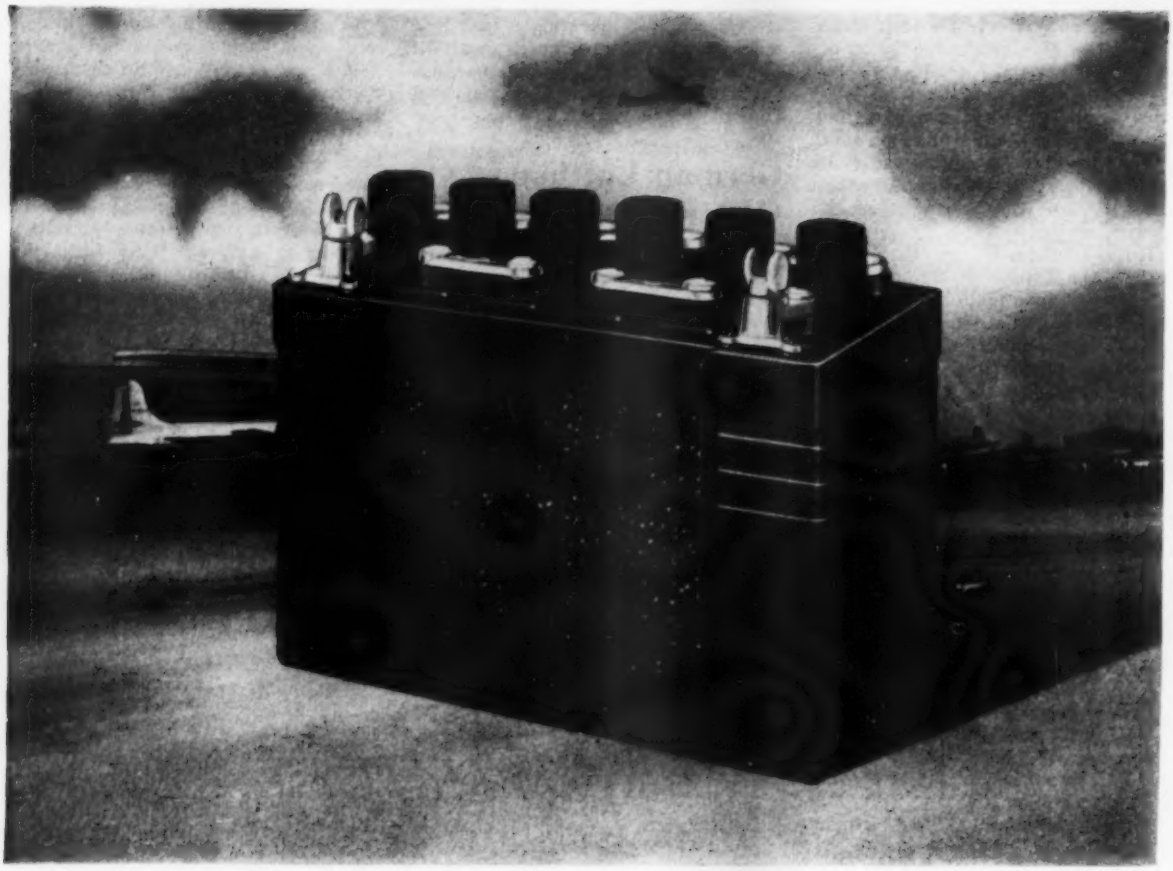
German Lufthansa Orders Metropolitans

Cologne—Lufthansa plans immediate expansion of its medium-range fleet.

In addition to two Convair 440 Metropolitans about to be delivered, a further three aircraft of this type have been ordered for delivery late this summer.

In addition existing option on the two additional Vickers Viscount 810Ds has been taken up, increasing the total number of turbo-prop airplanes ordered to nine.

"This means that our medium-range fleet, at present numbering only 4 Convairs, will reach a total of 18 units by about the end of next year", said Hans M. Bongers, Lufthansa president. "Lufthansa will use these additional airplanes to establish new routes within Europe, including services to Vienna, Zurich and Rome, to improve its domestic German network, and to open up new areas in the Near and Middle East.



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Single Sideband Appears Victor For Airline HF Communications

By Philip J. Klass

Washington—Single sideband appears to have won out over General Electric's new synchronous detection as the future airline replacement for existing amplitude modulation (AM) in long-range high-frequency communications. However, the GE system still is a strong contender for military use.

Failure to win airline support for synchronous detection at the recent symposium-debate, sponsored by Aeronautical Radio, Inc., and attended by nearly 500 airline, military, industry and government representatives, resulted from the air carriers' primary interest in spectrum economy.

While the GE system offers improved performance over present AM, its use of two sidebands (AW Oct. 15, 1956, p. 81) provides no more channels than existing AM whereas single sideband may provide up to twice as many channels, according to its supporters. The specific channel gain which SSB can provide in aeronautical air-ground communications was one of the most hotly contested questions at the Arinc meeting.

The question involves many factors, including the amount of suppression of the unused sideband relative to the strength of a weak desired signal at the same frequency, as well as the channel allocation arrangement used.

Lack of extensive operating experience in aeronautical communications with any of the systems under discussion made evaluation of conflicting claims difficult if not impossible. When panel members attempted to extrapolate from results obtained in mobile or point-to-point SSB communications, the conclusions were usually conflicting.

Rome Air Development Center hopes to resolve some of these questions this spring. RADC is installing both SSB and synchronous detection equipment in a C-131 for side-by-side evaluation tests, a spokesman told AVIATION WEEK.

Data Transmission

GE's Dr. Costas countered claims of a possible 2:1 spectrum economy using SSB by pointing out that a 10:1 or 100:1 channel saving could be achieved by the use of special speech processing and data transmission instead of presently used voice. Costas claimed that pulse coded communication was difficult if not impossible for suppressed carrier single sideband because of its inability to handle square waves without serious distortion. However, double sideband synchronous detection could handle data transmission without such troubles, Costas said.

The only alternative is for SSB to transmit data using sub-carriers, but this approach requires twice as much spectrum as would be required for data transmission by synchronous detection.

Support for Costas on this claim came from panel member Leonard Kahn, whose compatible single sideband system (CSSB), which uses one specially processed sideband plus a carrier, is able to handle data transmission without difficulty according to Kahn.

E. W. Pappenfus of Collins Radio Co., speaking for suppressed carrier SSB, denied that the system was unable to handle data transmission. Although admitting that SSB could not accommodate square wave pulses with short rise time without creating high power peaks, Pappenfus said that this type of pulse was not suitable anyway because of propagation problems in the high frequency region. Instead he suggested use of specially shaped pulses which could be accommodated by SSB.

Further, Pappenfus cited DEW Line and Collins experience in using SSB for teletype circuits as evidence that single sideband was suitable for data transmission.

Airlines Not Impressed

Panel moderator W. E. Brunt, of British Overseas Airways Corp., pointed out that the international carriers' primary objective in adopting a new system is to obtain the most effective voice communications, with selective calling and data transmission as secondary considerations. Trans Canada Airlines' Hal Ferris said that the most pressing problem at the moment is to obtain increased channels in the crowded spectrum. For this reason the advantages of synchronous detection in data transmission carried little weight with airline representatives.

However this was not true of military observers present. A Navy Bureau of Ships spokesman told the meeting: "We are faced with the prospect of data transmission whether we like it or not."

In conversations with AVIATION WEEK, a top Air Force communications expert indicated that data transmission figured prominently in the USAF's plans for its new global communications system. However, he believes that SSB can be used for such purpose.

Battle Royal

The Arinc symposium quickly became an acrimonious battle royal, with no fixed alliances between the combatants. For instance, Costas and Pappenfus agreed that the radio frequency carrier should be suppressed because it contributes nothing useful to the communications process and reduces effective power and intelligibility; a stand with which Kahn took sharp exception.

Kahn and Pappenfus found common ground in the view that considerable spectrum economy would result from using only a single sideband, a view with which Costas sharply disagreed. Then Kahn and Costas joined forces to attack the capability of suppressed carrier SSB to handle data transmission, a point on which Pappenfus disagreed sharply.

Battle Joined

When the discussion was opened to members of the audience, the battle was joined by representatives of Motorola, who broadly supported SSB. However, they claimed that their own type of SSB, which uses a low-power pilot carrier, enables if to avoid Doppler shift which threatens to be a problem for the Collins suppressed carrier SSB in high-speed jet aircraft.

The debate then became four-sided, between the three different types of SSB and synchronous detection.

Murray Crosby, of Crosby Laboratories, took the floor to disclose the details of a new technique which he believes will enable suppressed carrier SSB to get around the Doppler shift problem (AW Jan. 28, p. 28). The technique makes use of the fact that human speech consists of a basic 100-125 cps. tone plus harmonics of this frequency.

Fluid Battle Lines

The lines of demarcation between the systems under discussion became so fluid that at one point Dr. Donald Weaver of Montana State College stated that GE's synchronous detection receiver was really using only a single sideband in its operation, a point which Costas vehemently denied—although the receiver can be used to receive SSB signals.

When the question of SSB's data transmission capabilities was raised, and it was suggested that SSB could transmit data via sub-carriers, Dr. Costas

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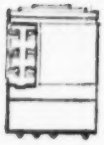

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Angular Momentum 100,000 gm-cm²/sec

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Gimbal Inertia—100 gm-cm²

Maximum Zero Signal—0.001 volts

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Application—Platform gyro for instrumentation

Weight—0.5 lb.

Size—1.75 in. diameter by 2.5 in. long

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The specifications on the new Honeywell MIG are detailed at left. For further information and for information on the full line of Honeywell Gyros, write: Honeywell Aero Division, Dept. AW-2-10, 2600 Ridgway Road, Minneapolis 13, Minnesota.

MINNEAPOLIS **Honeywell**

Aeronautical Division

said that under such conditions each of the SSB sub-carriers would actually have two sidebands, taking up twice as much spectrum as GE's double sideband synchronous detection system.

Cross-Fire

The Kahn CSSB system is not considered by the airlines to be a direct competitor of suppressed-carrier SSB. Because CSSB can be used with existing AM receivers with only slight modification of present AM transmitters, it is generally viewed as a transition period system and also possibly as simple, low-cost spectrum saver for domestic airlines that do not rely heavily on HF.

However, this fact did not keep Kahn from pointing out what he believed to be shortcomings of suppressed carrier SSB, or from getting caught in the crossfire between Costas and SSB supporters. Kahn emphasized that his CSSB equipment is considerably less complex, less costly than SSB, can be used with existing selective calling systems and has no Doppler shift problems. He also spoke of SSB's susceptibility to interference and jamming.

Speech Clipping

One technique now used in AM to increase the percentage of modulation and speech intelligibility is speech clipping. Kahn and Costas agreed that their systems could readily use speech clipping, claimed that SSB could not. With clipping, Costas claimed that synchronous detection could provide 10 db. gain over single sideband, while Kahn claimed a 2 db. advantage over SSB for his system with clipping.

Pappenfus admitted that conventional clipping can not be used in SSB, but said that different techniques could be used to accomplish the same end. In this Pappenfus was supported by John Honey, independent panel member from Stanford Research Institute and by representatives of Motorola.

Unsold

At the conclusion of the meeting, William T. Carnes, chairman of Arinc's Airline Electronic Engineering Committee, said that he had not heard anything new that answered basic objections which AEEC had raised earlier to the GE system. Carnes added that the question of which type of interim SSB system would be adopted by the airlines was something that would be resolved later.

Costas reported that GE is building pilot quantities of a synchronous detection adaptor which can convert existing high-frequency AM receivers to operate with the new technique. He indicated that these converters could be made available to interested airlines that wished to give them a trial.

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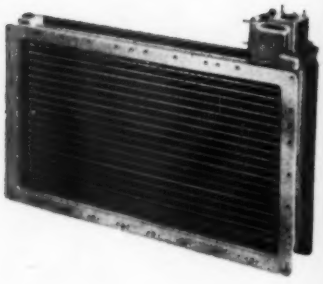

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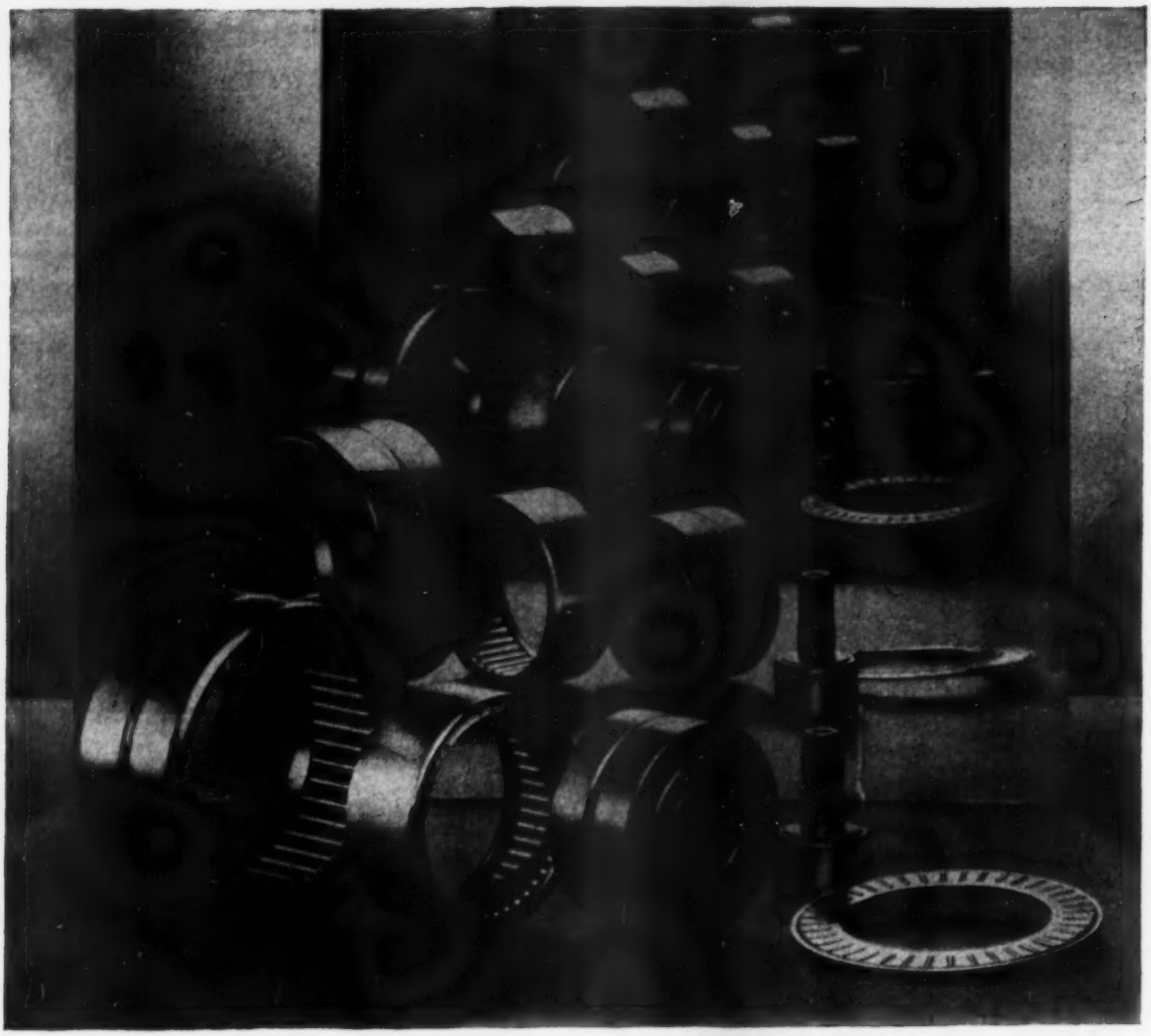

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Automatic Radar Developed by ARDC

Baltimore—An automatic radar performance monitor that eliminates the need to shutdown the radar during testing operations has been developed by the Air Research and Development Command's Rome Air Development Center.

It is based on ideas and techniques obtained from studies done by Rutgers and Wisconsin universities, the Polytechnical Research and Development Co., the Canoga Corp. and Rome Air Development Center. The monitor can be modified for use with existing radar sets and probably will be incorporated in future systems developed at RADC. Manufacturing will be done by Airborne Instruments Laboratory, Inc.

Bendix Awarded $10 Million Contract

Baltimore—Bendix Radio Communications Division of Bendix Aviation Corp. has been awarded a $9,925,631 contract for production of a new high-powered, extended coverage search radar developed by Bendix and the Air Research and Development Command's Rome Air Development Center.

Dual channel feature permits continuous operation during maintenance, and most maintenance is done from inside the building. Advancements also include improved moving target indicator, higher-powered transmitter and ultra-sensitive receiver.

Systems Simulator Sold to Spain

A $30,000 systems simulating laboratory designed and manufactured by Servo Corp. of New Hyde Park, N. Y. has been purchased by the Spanish government's General Industrial Materials Division.

The Servolab, an analog simulating computer, is a design and testing laboratory with wide applications in the development and synthesis of control systems of drone aircraft, control and guidance systems of guided missiles, automatic airspeed and altitude controls.

It also can function as an automatic production control system, data processing center and electro-mechanical computer. In effect, it is the connecting link between the analog computer and the production line.

System purchased by Spain includes 10 amplifiers, two corrective networks, a modulator, demodulator, four servo-board drawers, an indicator and an oscilloscope.

SYSTEM NUMBER	1 174-203	2 174-184	3 174-80	4 174-186	5 174-188	6 174-80
Type	Sinusoidal	Sinusoidal	Sinusoidal*	Sinusoidal*	Random or Sinusoidal	Random or Sinusoidal
Power Supply	Electronic	Rotary	Electronic	Electronic	Electronic	Electronic
Force Output	1250 lbs.	1500 lbs.	1500 lbs.	1500 lbs.	1500 lbs.	1500 lbs.
Frequency Range	5-3500 cps.	5-3000 cps.	5-3500 cps.	5-3500 cps.	5-3500 cps.	5-3500 cps.
Max. Load 10 g.	105 lbs.	130 lbs.	130 lbs.	130 lbs.	130 lbs.	130 lbs.
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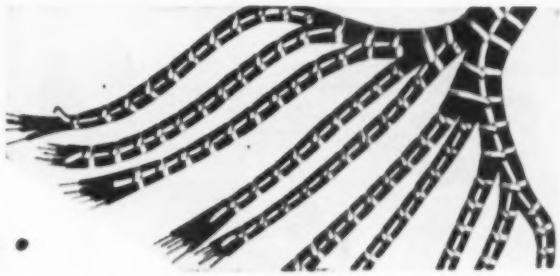

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You and your family will enjoy making Wichita your home, too! It was not without much forethought that the founders of Cessna located here. Third fastest-growing city in the United States, Wichita is a friendly city . . . a busy city . . . ideal for family life and recreation. The school system is excellent . . . with above-average facilities . . . easily accessible in all residential districts. Why not join Cessna—and GROW with Cessna? Your future is our future!

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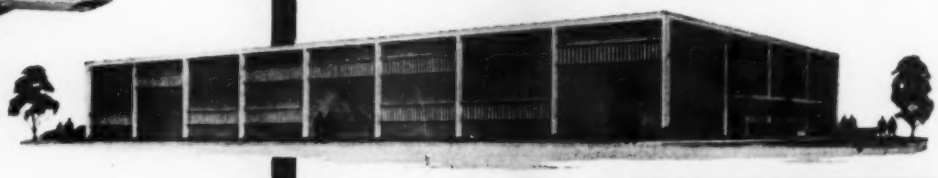

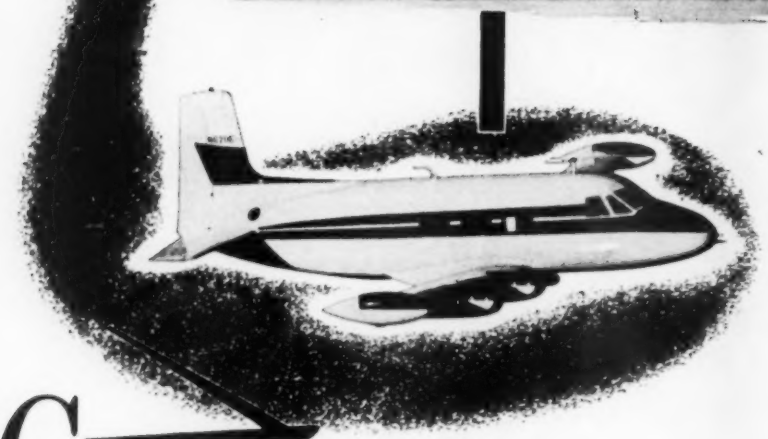

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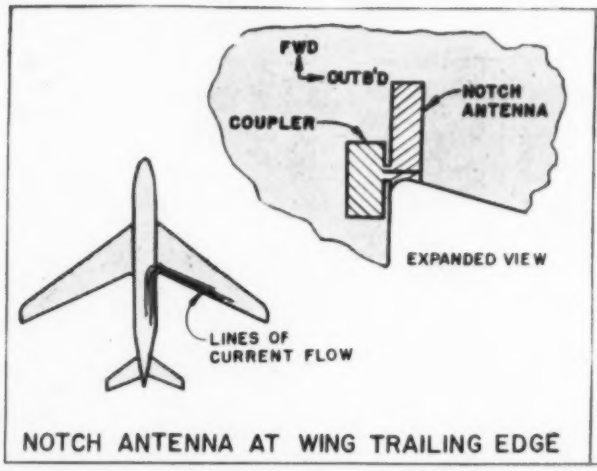
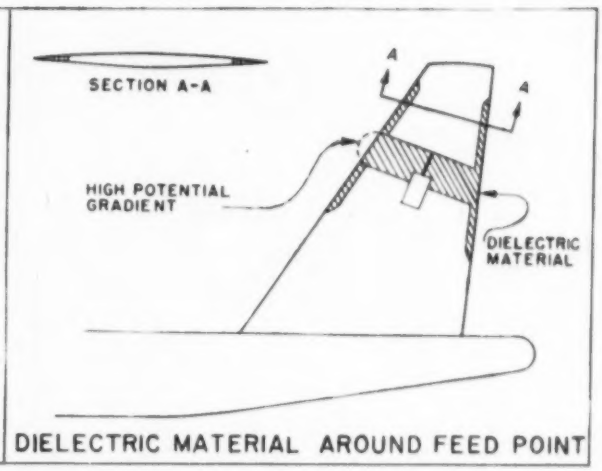


NOTCH ANTENNA AT WING TRAILING EDGE



DIELECTRIC MATERIAL AROUND FEED POINT

Higher Speeds Create Antenna Problems

New York—Increasing airplane speeds coupled with the need for improved avionic performance are creating antenna problems which require the joint efforts of the airplane structures engineer as well as the radome, antenna and avionic equipment designer.

Radome failure, for example, can cause loss of the airplane at high speeds —speed at which the radome structural strength is seriously reduced because of elevated temperatures, Boeing's Frank W. Bushman told the recent Institute of the Aeronautical Sciences.

"Antenna problems are the concern both of the aircraft and electronics designer," Bushman said. He added that new jet bombers now have as many as 35 antenna systems and new jetliners have approximately 15. Bushman limited his discussion of antenna problems to two types: airborne radar and high frequency communications.

HF Antenna Problems

Postwar aircraft speeds forced designers to develop the isolated tail cap antenna for HF communications to replace the long-used "clothes line" antenna. However, the isolated tail cap design is being made obsolete by still higher aircraft speeds.

One reason is that the dielectric material used in the tail cap lacks the required structural strength at the elevated temperatures experienced in high speed aircraft, Bushman reported.

Furthermore, the sharp leading edges and thin cross-section of the high-speed aircraft tail fin greatly increase the possibility of voltage breakdown and corona. Another problem arises because there is not sufficient space within the fin to mount antenna couplers, used to match transmitter and antenna impedance. With HF transmitters operating at higher powers, there is need for cooling the antenna coupler but the fin lacks space for such provisions, Bushman pointed out.

Bushman called on avionic equipment designers to develop a miniaturized antenna coupler capable of operating at higher temperatures. He also urged structures and antenna designers to develop techniques to permit wider use of dielectric material near the antenna feed point and along the fin's leading and trailing edges to (See sketches, above) increase antenna-to-structure spacing and thereby reduce voltage gradients and breakdown problems.

New Notch Antenna

A promising new approach to HF antenna design for high speed aircraft is the "notch" antenna, Bushman said. The new type antenna consists of a notch section located at the trailing edge of the wing near the root and serves to couple currents in the edge of the wing, Bushman said.

Advantages of the notch antenna, according to Bushman, are its non-structural configuration and the low voltages developed across it. A disadvantage is the difficulty of transferring power efficiently into its very low resistance-inductance load. This, Bushman said, is a challenging problem for avionic designers.

Radome Problems

Present radome structural problems can not be solved simply by beefing up the thickness of the material because of the adverse effects on the transmission of radar energy, Bushman pointed out.

Another current radome problem is the change in radome material dielectric constant with elevated temperatures. This change, over the range of airplane speeds, can cut transmission efficiency by 20% or more, Bushman indicated. The change in dielectric constant also produces angular bearing errors in radar beam position.

Bushman suggested that a solution to the structural strength problem might be found by integrating metal into the radome material similar to the way that steel is used to reinforce concrete. The problem, however, is more difficult because the metal in a radome can adversely affect radar performance.

Improved radome materials which are stronger, lighter in weight, and whose dielectric properties can be artificially controlled to compensate for temperature effects would be welcomed by aircraft designers, Bushman said.

The problem is becoming more critical because of excessive skin cut-outs needed to permit streamline radome installations on small diameter fuselages with needle noses, Bushman pointed out.

New airplane configurations make it more difficult to install the larger radar antennas needed to provide increased radar resolution. Bushman challenged engineers to develop techniques which will permit efficient transmission of radar energy through radomes at near-grazing angles.

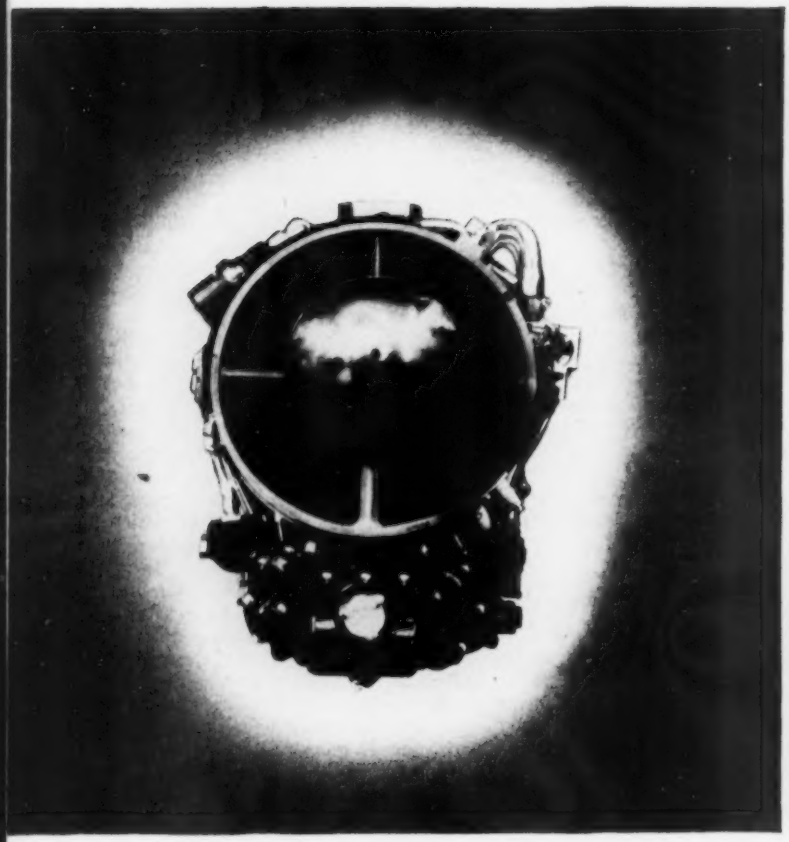
Another approach to solving current radar antenna-radome problems may be the use of flush-mounted arrays of small phased slots which require only tiny dielectric covers, Bushman suggested.

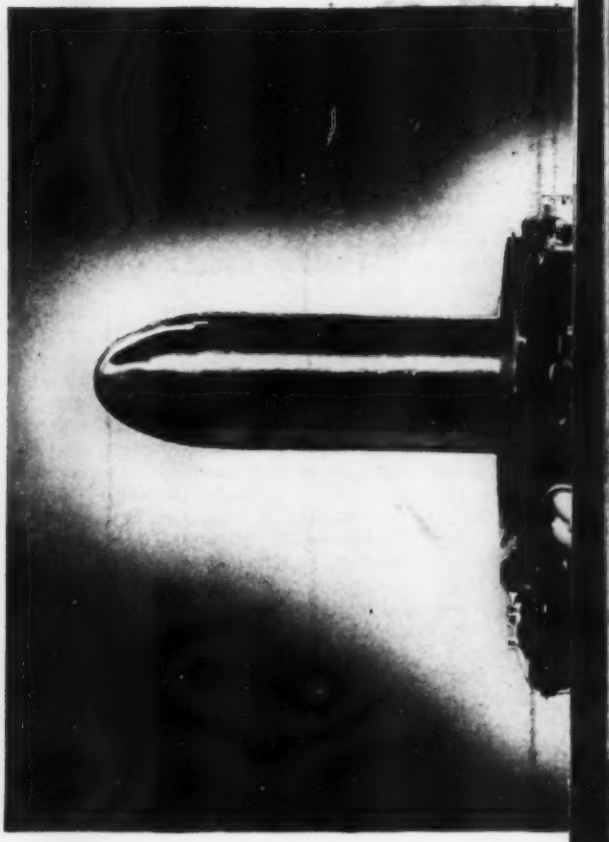
However, until these come along, Bushman suggested that avionic designers find some way to detect incipient physical failure in radome structures to permit their check-out prior to the beginning of a long flight.

General Electric's New

1050 HP

Offers small aircraft economical gas turbine power . . .





A high-performance, axial-flow gas turbine, the T58 is designed to power helicopters, small transports, convertiplanes and other VTOL or STOL type aircraft into a new era of flight.

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Backed by the experience that created such famous aircraft gas turbines as the J47 and J79 turbojet engines, the T58 is the product of Navy vision and the engineering skill of General Electric's Small Aircraft Engine Department in Lynn, Mass.

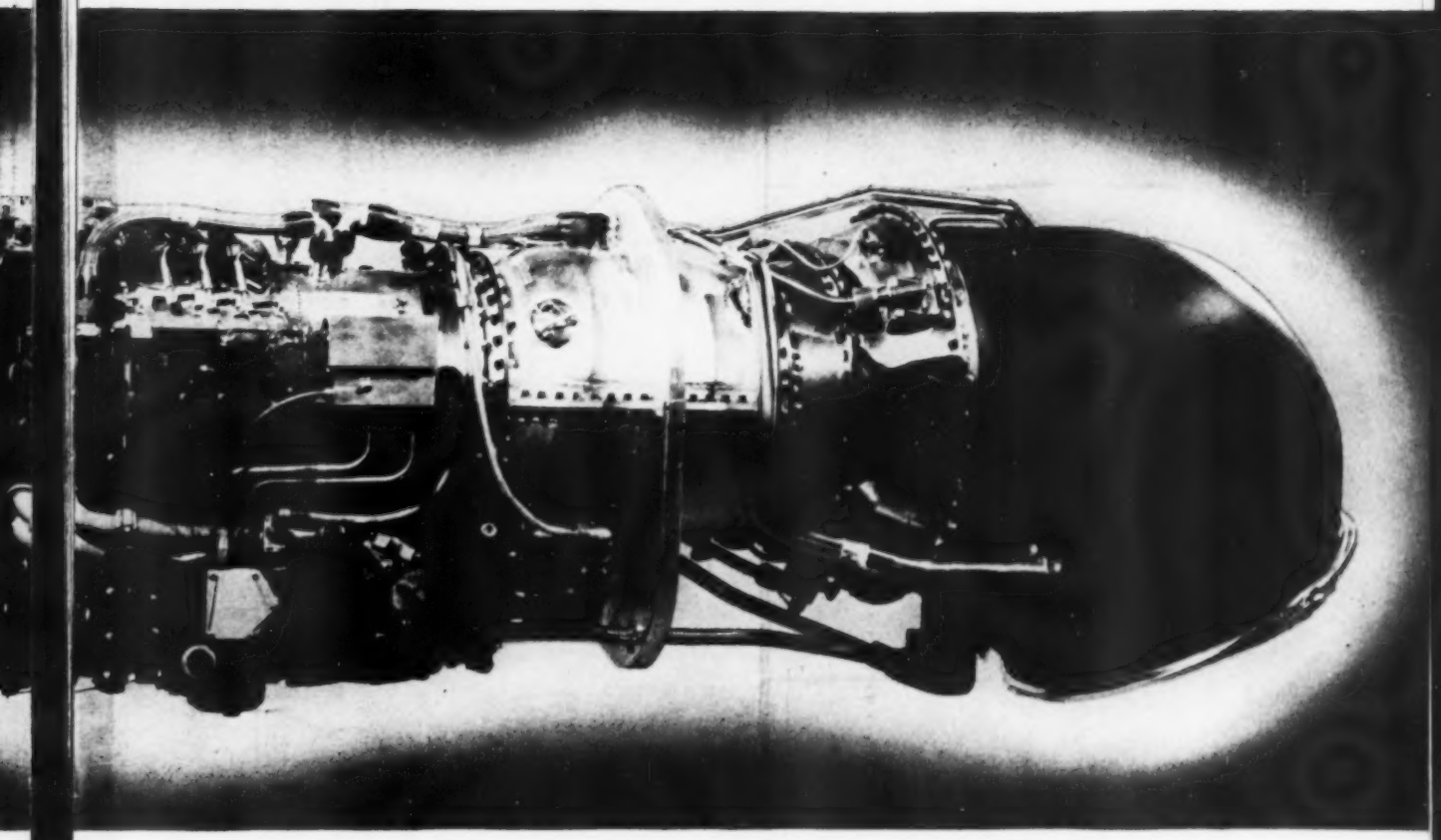
Find out what the T58's many features can mean to your aircraft. Call your local General Electric Aviation & Defense Industries Sales Office, or write: General Electric Co., Sect. 233–4, Schenectady, N. Y., for the T58 descriptive bulletin.

All figures based on engine without helicopter reduction gear. Gear weight: 75 lbs.

T58 Turboshaft Engine

0.67 SFC

new levels of performance and operating efficiency



Inside a shell 33 inches long by 16 inches in diameter at maximum flange, the T58 incorporates the most modern compressor design, straight-thru full-annular combustor, 2-stage axial-flow gas generator turbine, and single-stage free power turbine.

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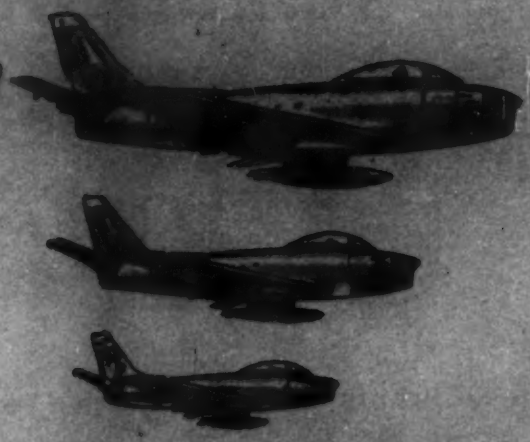

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Microwave Unit May Improve Radar

Radically new type of solid-state microwave device whose extremely low noise level may improve radar receiver sensitivity by a factor of several hundred has been announced by Bell Telephone Laboratories.

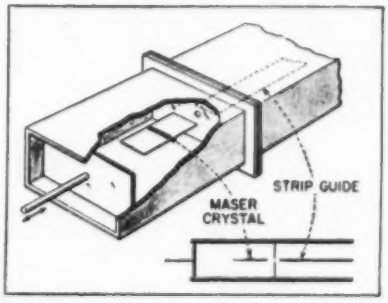
The new device is a solid-state version of the Maser (Microwave Amplification by Stimulated Emission of Radiation) principle first demonstrated in 1954 by Professor C. H. Townes of Columbia University using a beam of ammonia molecules.

The new solid-state Maser appears capable of operating in the centimeter and millimeter wavelength regions. The device tested by BTL produced continuous oscillations at 9,000 mc., with power output of 20 microwatts. When used as an amplifier, device is expected to have bandwidth of about 100 mc., and can be easily tuned by changing strength of its applied magnetic field. BTL emphasizes that device still is in early research stage.

The solid-state Maser operates with electric spins in a paramagnetic crystal instead of depending upon motion of charged particles at high temperatures as in conventional oscillators and amplifiers. This explains its very low inherent noise.

The BTL unit uses a crystal of gadolinium ethyl sulphate, one of a group of materials known as "ionically bound paramagnetic salts," mounted in a waveguide cavity.

Lawrence G. Rubin of Raytheon, speaking at the recent Institute of the Aeronautical Sciences meeting, predicted that solid-state Masers would permit microwave oscillators with stabilities of one part in 10_{10} to 10_{12}. Such stability would be useful in navigation systems, such as Navarho, or for secure communication devices based on precise timing. Rubin said he also suggested that Masers would find use as low-noise microwave frequency conversion devices.



BTL predicts that the new device will "open wide new vistas in the microwave field" if its theoretical potentialities are realized in practice.

Expansions, Changes In Avionics Industry

Radio Corporation of America has formed a Special Systems and Development Department for planning and development of military systems. Dr. C. B. Jolliffe, vice president and technical director of RCA, has been named manager. Others named to posts include: A. W. Vance, chief systems engineer; G. L. Dimmick, chief development engineer; A. C. Gay, manager projects engineering; and Dr. E. W. Pritchard, administrative engineer.

Other recently announced expansions and changes in the avionics industry include:

• **Hoover Electronics Co.,** Baltimore, has established an Instrumentation Division at Albuquerque, N. M., to handle development of telemetering and missile-ordnance instrumentation for a company in the West Coast region. J. D. Patrick will head new unit.

• **Magnetic Amplifiers, Inc.,** New York, has opened new West Coast Division at 136 Washington St., El Segundo, Calif. New facility will provide both engineering and manufacturing facilities for company's power supplies, regulators and servo systems. Morris R. Beard is general manager of new division; William J. Muldoon, chief engineer, and Harry A. Remer, sales manager.

• **Servomechanisms, Inc.** will build new 55,000 sq. ft. plant in eastern Nassau County, Long Island, N. Y. to house expanded engineering and production operations of company's Subsystems Group. Firm's Westbury, L. I., plant will remain in use when new facility is completed late this year.

• **Gulton-Speidel, Inc.** is new jointly owned corporation formed by Gulton Industries, Inc. and the Industrial Division of Speidel Corp. Gulton is producer of precision components and instruments; Speidel produces aircraft precision parts. Dr. L. K. Gulton is chairman of the board; Paul Levinger is president of the new operation.

• **Hedin Tele-Technical Corp.,** Mountain View, N. J., maker of relays and controls has changed its name to General Automatic Corp. Aside from new name, and recent move from Livingston, N. J., there have been no changes in corporate structure or personnel.

• **Robertshaw-Fulton Controls Co.** has purchased The Beta Corp., Richmond, Va., maker of vibration monitoring equipment. New acquisition will be moved to Philadelphia and consolidated with company's Fielden Instrument Division.

• **Mid-Continent Manufacturing, Inc.,** Manhattan Beach, Calif. has dissolved its Datran Engineering Corp. and set up its operations as an integrated division called Datran Electronics at new facilities at 3615 Aviation Blvd., Manhattan Beach. New division is headed

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by Lewis Emmerich. Datran develops and makes electronic and electromechanical devices and sub-systems.

• **Hetherington, Inc.**, maker of switches and indicator lights, is building 16,200 sq. ft. plant in Folcroft, suburb of Philadelphia, one half mile from company's present Sharon Hill plant.

FILTER CENTER

▶ **Cryotron Computer**—Arthur D. Little, Inc., is building digital computer that uses 215,000 cryotrons, new replacement for tubes and transistors. The cryotron, about the size of a transistor, consists of a conductor surrounded by control winding, both of which are cooled to near absolute zero (minus 420F). At this temperature the conductor has practically zero resistance until control winding is excited which enables device to operate like a switch. Major cryotron advantage is its simple construction and low cost.

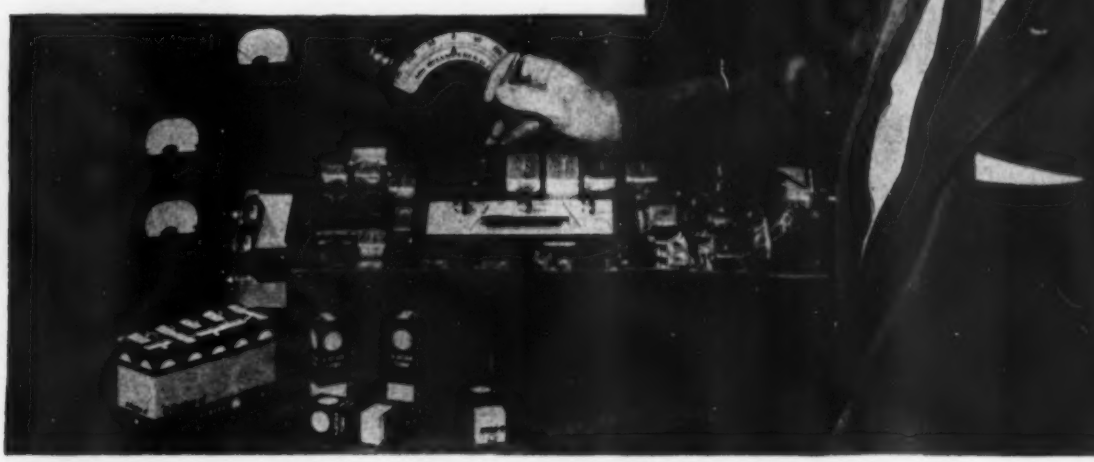
▶ **Preferred AFC Circuit**—National Bureau of Standards has developed a radar automatic frequency control circuit which can be used with only minor modification whenever a 30 mc. intermediate frequency is required with pulse widths of 0.5 to 5.0 microseconds, NBS says. New circuit, developed under Navy Bureau of Aeronautics sponsorship, will be incorporated in new supplement to NBS Handbook of Preferred Circuits.

▶ **EAL Installs Transponders**—Eastern Air Lines expects to have nearly 30 of its aircraft equipped with air traffic control transponders by mid-summer in order to participate in the Civil Aeronautics Administration's beacon evaluation program.

▶ **New Radar Target Simulator**—New simulator which can generate the display of up to six individual moving targets on any standard indicator has been developed by Electronics Division of Fairchild Controls Corp., subsidiary of Fairchild Camera & Instrument Corp. Device can be used with PPI, B-scan and A-scan type displays. Target positions, paths and speeds are adjustable with top speed of 10,000 kts.

▶ **Improved Magnetic Alloy**—Supermendur is name of new alloy developed by Bell Telephone Laboratories which has higher permeability and lower hysteresis loses at higher flux densities than any material perviously available, according to BTL. Alloy, consisting of 49% iron, 49% cobalt and 2% vanadium, should permit at least 30%

Some of the world's most spectacular mountain scenery greets passengers flying across South America in Braniff "El Conquistador" planes.



SAYS **Howard R. Dreggors, Director of Communications, Braniff International Airways—**

"G-E 5-Star Tubes help maintain communications on Braniff's 2500-mile South American flights!"

"Radio equipment like that shown here keeps our planes constantly in touch with two or more of the 14 ground stations spaced between Lima, Peru, and Rio de Janeiro, Brazil. And the G-E 5-Star Tube I'm pointing to is one of thousands we use for extra communications dependability—not only on the long run non-stop across South America, but wherever Braniff planes fly, in the United States or overseas.

"Braniff was a pioneer in encouraging the development of high-reliability electronic tubes for airline use—has installed them in critical sockets from the time manufacture started. Today we use General Electric 5-Star Tubes in all airborne or ground applications for which types are available.

"Our records show they far outlast regular tubes. Their failure rate is a minimum percentage. We look on 5-Star Tubes as a proved sound investment that means increased safety and better flight-schedule maintenance for Braniff."

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CONTOUR-TRENTWELD

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New Contour-Trentweld outperforms any other pipe, welded or not. Here's why: *Contour-Welding* is an entirely unique method of producing pipe and tubing. It puts gravity to work to pull down the molten weld metal until it exactly conforms to the contour of the pipe. Result: A smooth pipe or tube free of undercut or bead.

What's more, the *Contour-Weld* process *starts* with uniformly rolled stainless strip, which insures constant wall thickness throughout the pipe.

But the only way you can fully appreciate the advantages of new *Contour-Trentweld* is to try it. We think you'll agree, *it can't be beat by any other pipe, welded or not.*

Why Trent's Exclusive Contour-Welding Process Means Smoother Welds . . .

Normally, in producing welded pipe, the weld is made at the top. But gravity plays a nasty trick. It tugs at the fluid metal in the weld zone, pulling it down toward the middle of the pipe. The result, particularly in the heavier gages, is a perceptible bulge where it hurts the most – right on the I.D. surface. If you try to get rid of the bulge – at fair cost – the metal is undercut – and corrosion and erosion start there.

But Trent put a stop to that – simply by going into partnership with gravity. With their exclusive *Contour-Welding* process, they weld at the bottom – and gravity works for them. For then, the bulge is in the opposite direction – blending in perfectly with the contour of the pipe itself.

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reduction in size and weight of transformer cores. New alloy is similar to the 2V-Permendur developed previously by BTL, but has much improved characteristics, with hysteresis losses reduced by factor of 10. Maximum permability is now 66,000 at 20,000 gausses; remanence is 21,500 gausses. Core losses are less than 6 watts per pound at 400 cps at a flux density of 100,000 lines per square inch. Hysteresis loop is rectangular with a flux swing of 45,500 gausses from minus remanence to plus saturation, BTL says.

▶ **Speedy Card Shark**—"Cardatron," called the fastest multiple electronic system yet devised for processing punched cards, has been delivered to Norton A. F. Base, San Bernardino, Calif., for use in Aircraft parts inventory control. System was developed by ElectroData Division of Burroughs Corp. Cardatron is expected to cut in half time required to check accuracy of Norton's $3 billion inventory, stored on 300,000 punched cards, and to update these records daily. Cardatron permits simultaneous use of several punched card readers by serving as a buffer to briefly store punched card information before transmitting it to a digital computer.

▶ **Australian Tacan**—Australian Department of Civil Aviation is investigating the possibility of modifying its 200 mc. DME (distance measuring equipment) so it can also provide aircraft bearing information, not unlike the U. S. Tacan system. Antenna has been modified to permit rotation at 1,500 rpm. Flight tests will begin shortly.

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Components & Devices

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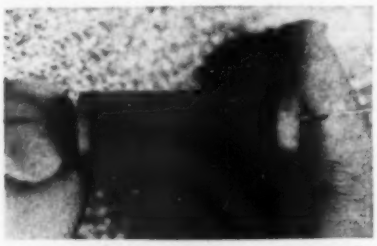
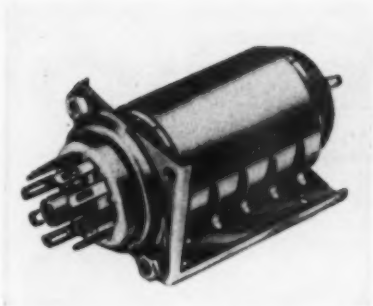
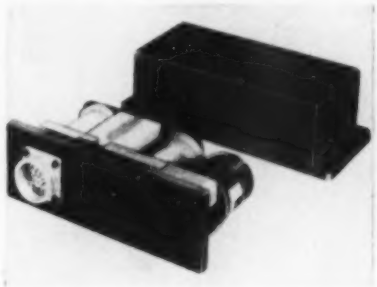


0.15 oz. Battery is designed to withstand temperatures of −100 to 165F. General Electric Co., Specialty Electronic Components Dept., W. Genesee St., Auburn, N. Y.



• **Right-angle** heat-dissipating tube shield, for all sizes of 7 and 9-pin miniature tubes, employs soft silver or copper wrap-around for bulb and separate beryllium copper spring clip to provide maximub tube retention characteristics. Design of right-angle mounting bracket assures proper pin allignment of the tube and integral socket through use of slug between base and shield wrap-around. International Electronic Research Corp., 145 West Magnolia Blvd., Burbank, Calif.

• **Multiple-channel programmer,** Model MPR-13, provides up to 13 channels of any type of electrical programming, either repeat cycling or random in nature. Accuracy is roughly one part in 50,000. Device uses insulated tape



resembling 35 mm. film, which advances at precise rate between 13 contactors. Timing of program is determined by location of holes punched in the tape. Programmer weighs under 4 lb., measures 2 x 3 x 6 in. Photographic Products, Ins., 1000 No. Olive St., Anaheim, Calif.

• **Miniature precision power resistors,** rated 25 and 50 watts, will dissipate 80% of rated power at 40C with an internal hot-spot temperature of only 260C, lower than MIL spec requirement. Special material which fills in area between pre-coated resistor and black anodized aluminum case is responsible for lower temperature, manufacturer says. Sage Electronics Corp., 302 N. Goodman St., Rochester, N. Y.

• **Magnetic amplifier,** Model AEC-0-202, single-stage, 400 cps, suitable for

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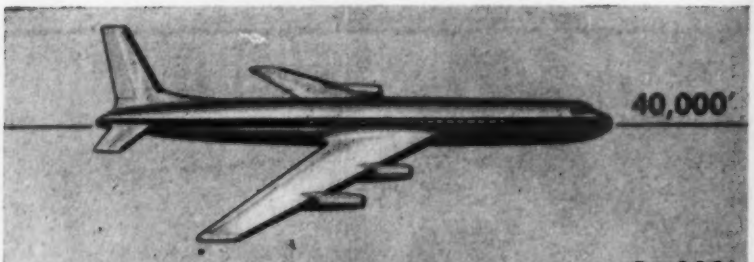

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Safety considerations for new jet airliners demand a standby oxygen system for passengers and crew in the remote event that cabin pressurization is lost.

On the new commercial turbo-jets, which fly at 40,000 feet, this system must be able to supply pure oxygen to passengers and crew via individual demand regulators. On the turbo-prop airliners, flying at altitudes up to 30,000 feet, this system may use continuous flow regulators.

Pioneer-Central announces a new Bendix High-Altitude Oxygen System to satisfy requirements of the forthcoming high-altitude jet transports. Advantages include:

- Maximum protection for flight from 40,000 feet at any rate of descent.
- Provision for automatic visual and/or audio warning.
- Instant availability to each passenger and crew member when needed.
- One-piece, self-adjusting face masks for passenger use.
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driving BuOrd Mark VII servo motor or similar two-phase motors rated up to 6 watts. Unit measures 1.75 in. dia. x 1.75 in. high, is designed to MIL-E-5272. Power gain is over 300, response time is 2.5 milliseconds and output voltage is 60 v. maximum from 115 v. input. American Research and Manufacturing Corp., 920 Halpine Ave., Rockville, Md.

• **High power X-band isolator,** Model H500, provides minimum of 8 db. isolation over band of 8.6 to 9.6 kmc., with less than 0.5 db. insertion loss. VSWR is 1.10. Power rating is 500

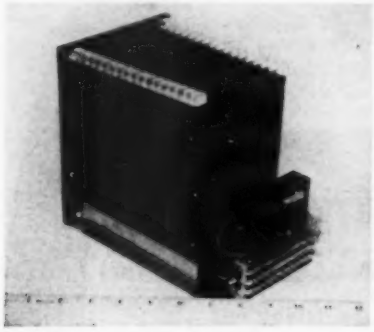
watts CW or 500 kw. pulse. Unit is air cooled. Litton Industries, Components Div., 5873 Rodeo Rd., Los Angeles 16, Calif., and 215 So. Fulton Ave., Mt. Vernon, N. Y.

• **Narrow-band frequency detector,** Type F-992, delivers output current that is linearly proportional to frequency of input signal within band from 375 to 425 cps. Similar detectors are available covering a 10% bandwidth at any center frequency between 30 cps and 5 kc. Linearity is with 0.25%

ing fail-safe indication of absence of input signal. Device operates from −55C to 72C, withstands 10G to 2,000 cps and 30G shocks in all directions. Detector measures 1¼ in. dia. x 2 in., weighs 6 oz. Airpax Products Co., Middle River, Baltimore 20, Md.

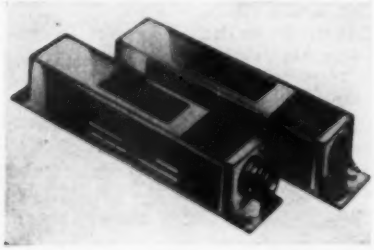
Instrumentation

• **Digital comparator** permits operation of conventional analog servo system from digital input information, with the addition of an analog-to-digital converter driven by the servo motor. De-



vice is designed for airborne use, employs no tubes or relays, operates over temperature range of −55C to 55C, occupies 259 cu. in. Bulletin 418 gives specs and application information. Norden-Ketay Corp., Commerce Road, Stamford, Conn.

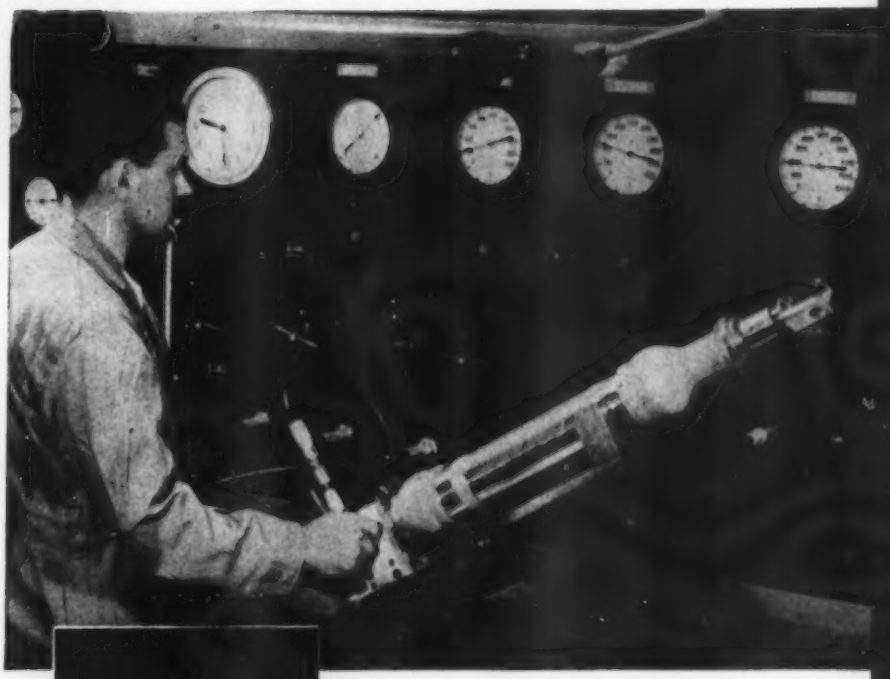
• **Dual-axis accelerometer,** Model GDM, measuring only 1¼ in. square x 6 in. long, and weighing 14 oz., consists of two mutually perpendicular G-sensors driving potentiometer pick-offs. Units are available in ranges of ± 2 Gs



to ± 30 Gs, or in unbalanced ranges if desired. Damping is provided by silicone oil. Genisco, Inc., 2233 Federal Ave., Los Angeles 64, Calif.

• **Portable electronic counter,** Model 1000 weighs 7 lb., provides single electronic decade and five-digit mechanical register and can count at rates up to 12,000 per minute. Unit operates from 115 v.a.c. and has 90 v.d.c. power available for operation of photocells or other accessories. Performance Measurements Co., 15301 W. McNichols Road, Detroit 35, Mich.

Checked to your specifications ...Shipped to your schedules



This test stand checks actuating assemblies under simulated operating conditions.

Some of the actuating assemblies now being produced by Ex-Cell-O for aircraft and guided missiles.

XLO

Ex-Cell-O produces actuators and assemblies in volume for jet planes and guided missiles.

You can rely on Ex-Cell-O to handle your precision production and assembly work on schedule; to lend you any assistance required to solve your individual problems. For information or a quotation, write, phone or wire the Precision Products Division of Ex-Cell-O.

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56-29

COST

IS A BI[illegible]ER W[illegible]RD THA[illegible]EVER

RINGS ROLLED & FLASH-WELDED from a Mill-Rolled Section

SAVED $220.63 EACH

A ring originally designed as a casting weighed 390 lbs. and cost $280.00. Later it was purchased from Amweld, as a rolled and flash-welded ring made from a contoured mill-rolled shape. More than triple savings resulted. Basic cost dropped to $59.37 and weight was reduced to 94.5 lbs. In addition, considerable time and money were saved in the finished machining operation.

Switching to Flash Butt-Welding of Mill-Rolled Sections Slashed Production Cost 76½%

SAVED $103.46 PER RING

Rough rings purchased by a well-known manufacturer of jet aircraft engines weighed 135 lbs. each. Most of this weight was excess metal which had to be machined away. American Welding's Industrial Products Division, working with this company, studied the product and recommended a flash butt-welded ring, formed from a special mill-rolled shape. Adopting this new ring saved 88 lbs. of metal and eliminated much of the machining time required.

American Welding can help cut costs in your plant by suggesting the use of rings rolled and flash welded from mill-rolled or extruded shapes.

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Contact the Industrial Products Division of The American Welding & Manufacturing Company. We will be glad to show you more actual cases of cost savings.

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USAF's Perkins Poses Budget Problems

By Courtland D. Perkins

The mounting cost and complexity of weapon systems, combined with the stabilized budget ceilings presently in force, are creating considerable concern in the dynamic Air Force development program.

Budget considerations present Air Force planners with the complex problem of developing and maintaining an adequate force-in-being, as well as maintaining a vigorous research and development program focused on new weapon systems for future strategic, defensive and tactical missions.

I do not plan to dwell on this overall problem in detail as I do not consider myself expert enough over the full sweep of the problem to do it justice. However, I do want to discuss at least two important correctives which, if handled properly, would go a long way towards resolving the dilemma. The two possible correctives that I would like to discuss with you today are those of competent and rapid evaluation and reduced system complexity.

In order to introduce this problem properly, let us take a mission area such as strategic warfare for an example. At the present time, we all know that our major force-in-being consists, in the large, of manned long range, chemically powered jet aircraft which the Air Force uses to operate intercontinentally, sometimes with the aid of a tanker fleet.

This weapon system is both costly and complex but most certainly will do the job and represents the most advanced solution with respect to the present state-of-the-art.

The research and development problem is to develop strategic weapons for the following time period in the face of the tremendous cost of producing and operating the systems necessary to give us our present capability. The same thing is true for other mission areas such as air defense and tactical warfare.

Proper Selection

Referring once again to our example of a strategic system, it is in the development of the follow on system that we run into our inherent trouble. The present state of technological advance is such that our strategic mission might be solved by one of many new weapon systems, all of which would incorporate to some extent enough capability over our present system to work, at least on paper, against improved defenses assumed for the same time period.

Most properly, all of these capabilities should be studied in our research and development program to insure a proper selection from these new systems that could include manned supersonic bombers—both chemically and nuclear powered—flying missiles, ballistic missiles and others. It would be the safest thing technically to develop all of them, selecting the best only after it has been adequately proven by comparative performance testing.

This is just what we have been trying to do over the past few years, but, as new development programs mature in their development cycle, they become more and more expensive, and, if all are carried along, the amount of money in a stabilized budget available to each becomes less and less adequate; if some pruning isn't done, all starve to death. We then achieve little but at very great cost.

With a level budget, we cannot afford all of these systems, and we are being forced to choose between them before we know their full capabilities or know definitely what kind of a war we will want to fight with them when they become operational. We have experience in choosing between several competitors for the same mission if they all are technically similar, but we are less experienced in choosing between varying weapon systems using completely different technical approaches towards the same end.

Courtland D. Perkins

Courtland D. Perkins was named chief Air Force scientist last April while serving as professor and chairman of the Department of Aeronautical Engineering at Princeton University.

A graduate of Swarthmore College, Mr. Perkins received a graduate degree in aeronautical engineering from the Massachusetts Institute of Technology. During World War II, he headed the Stability and Control Unit of the Aircraft Laboratory at Wright Field. He has served as a member of the USAF Scientific Advisory Board and the National Advisory Committee for Aeronautics' Aerodynamics Subcommittee and has conducted research in the fields of airplane and missile stability, control and guidance.

Hurried Choice

Evaluation of these systems today is sometimes forced upon us before we are ready and final choices may be made without the degree of competent evaluation required.

Natural pressures in these choices stem from those who feel that we must stay with piloted, chemical powered aircraft, from those who feel that we must move on to the ballistic and flying missile, and those who are nuclear propulsion adherents. These systems are also subject to technical and programming pressures causing temporary oscillations in individual projects which results in serious slowing down of the total program.

The problem of competent, rapid and early evaluation between widely diversified weapon systems is a new one and brought about, as I have said, by the stabilized budget, our expensive but necessary in-house capability, increased international competition and the increasing cost of developing new systems for the future.

Impact on Economy

An evaluation team studying new weapon systems must not only be competent to compare the technical qualifications of the new weapon systems but also must evaluate their impact on the nation's economy as well as the political implications developing as a result of their use.

As weapon systems development becomes more and more expensive, the problem facing the evaluator becomes more and more difficult. It becomes more and more urgent that we choose between possible systems at the earliest stage in the development cycle at a

New Vickers Airborne Electrical Power Package

. . . Saves Weight and Space

Utilizes the Hydraulic System for More Efficient Production of AC Power

This new isolated electrical power package provides closely regulated AC power with minimum weight and envelope while drawing its power from a hydraulic system. In new designs or when adding electronic equipment to aircraft designs in which the electrical system is already loaded to capacity, this versatile package provides the needed AC power from flow available in the hydraulic system. This generally is permissible without system change as the full flow is seldom demanded except for a few seconds under rare circumstances. Even in such cases, full flow can be guaranteed to these hydraulic functions through the use of a simple priority valve which starves the AC power package momentarily.

Less Weight and More Efficient

Important weight savings are achieved through the use of this package instead of an inverter which may also require an increase in the DC generator and line capacities. In one instance, the 10.5 lb 1 kva package replaced a 38 lb inverter for co-pilot instrumentation. An additional advantage is that the package has 62% overall efficiency while that of the inverter was 35-40%.

Extreme altitude operation is no problem as the Vickers isolated electrical power package contains no brushes or other altitude-sensitive components.

Features of AC Generator

The permanent magnet type AC generator has excellent life and reliability. It requires no bulky voltage regulator . . . is inherently smaller and lighter than conventional generators due to the elimination of the exciter and slip rings. It also has higher overall efficiency resulting from elimination of all excitation losses. Additional advantages are that the permanent magnet is unaffected by momentary short circuit, or separation of field and armature without keeper, or by temperature cycling. It is also not susceptible to aging or shock. This unit is 120/208 volt, three phase, wye connected with 400 cps at 8000 rpm. It is capable of continuous duty under environments of 0-55,000 feet altitude and ambient temperatures from −65 F to 250 F.

Hydraulic Motor Drive

The generator is directly driven by a Vickers Constant Speed Hydraulic Motor having fixed stroke and an integral flow control valve that maintains an 8000 rpm speed setting within ±2½% regardless of the load (as long as valve inlet pressure is greater than load requirement). For the unit shown above, maximum operating pressure is 3000 psi while rated output of 1 kva requires operating pressure of 2200 psi. Special configurations will maintain 400 cps frequency within ±0.1% regardless of load. This motor has a very high horsepower-weight ratio and its overall efficiency exceeds 92%. It is a time-proved design capable of many hundreds of hours of continuous service without attention.

Many Uses and Sizes

The applications for this isolated power source are numerous. For multi-engine aircraft, its use for co-pilot instruments provides dual reliability. This package has been used to supply controlled frequency AC power in emergencies when the only source of power in the airplane is a ram air turbine driven pump. The efficiency of this arrangement minimizes the size and weight of the ram air turbine necessary to provide emergency hydraulic and electric power.

Now available in the sizes listed below, larger packages can also be supplied from existing components. Vickers is prepared to develop the package best suited to a specific need. For further information, get in touch with your nearest Vickers Aircraft Application Engineer.

Vickers Airborne Electrical Power Packages

kva output	weight, pounds
0.5	7.0
1.0	10.5
1.5	12.5
2.0	15
2.5	17
3.0	19

Larger capacities with minimum weight are available.

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point where they are the least costly.

It is important to improve our evaluation procedures and capabilities within the Air Force. I feel, therefore, that our present position with respect to technological advances and budgets could be improved by improved methods of continuous evaluation within the Air Force and feel that this evaluation is one of the most important assignments that any military research and development organization might be given.

More Ingenious Solutions

The second aspect of the problem to which I would like to draw your attention is really a corollary of the first.

An increased effort must be made to find simpler and more ingenious solutions to our mission problems.

We seem to solve many of our military problems with too heavy a reliance on dollars and manpower. I feel that our scientific community has many times led the way towards these complexities.

In many cases, simplicity of concept, development and engineering design and tactical operation could reduce budget requirements many fold, making it possible for us to carry a wider variety of systems through final development test.

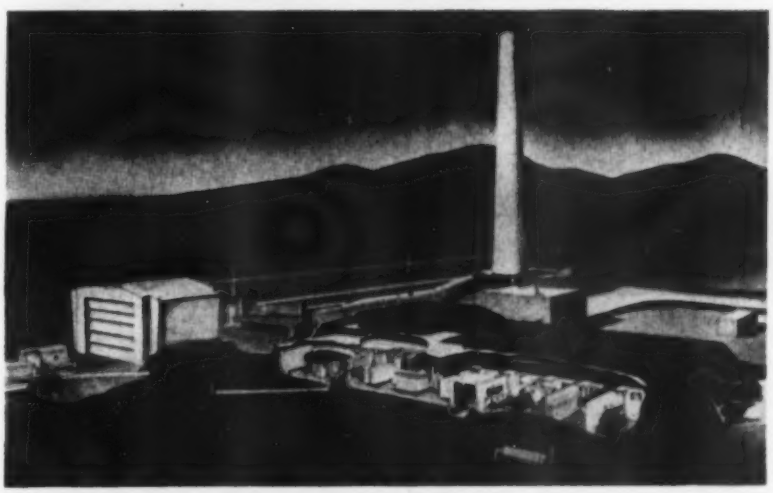
I feel that if we paid more attention to reducing problems to their simplest form, we could go a long way toward solving not only our money problems but our technical manpower shortages at the same time.

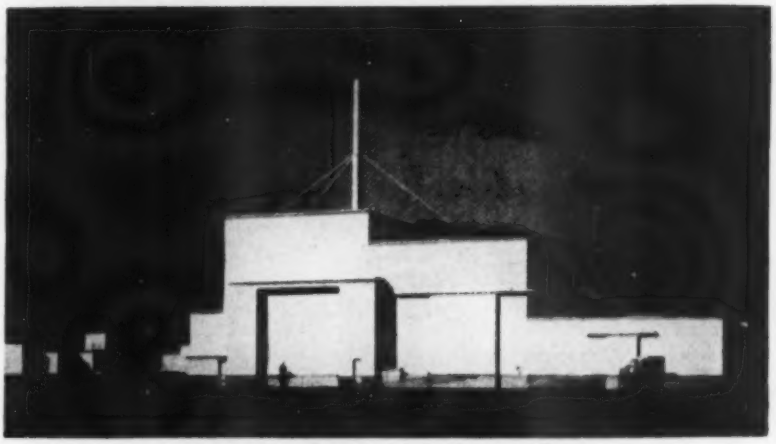
As I stated before, a real responsibility rests with our scientific and technical community for ingenuity and simplicity of original concept and engineering design and with the military for simplified tactics and concept of operations that could be satisfied by simpler weapons systems.

Forced Toward Complexity

As the military planner strives to formulate optimum weapon system requirements, he will exploit to the fullest the present projected state-of-the-art. In order to achieve the last possible increment in system performance, the engineer or designer is forced towards more and more complexity in order to attain the last final increment to satisfy these requirements.

The military planner and the technical community must work in the closest possible harmony in order to insure the best compromise between what is required and what is possible. For example, when designing for maximum possible range, the gross weight range characteristic is such that for the last small increments of range we pay heavily in system gross weight and thereby cost. The military planner must be aware of this scientific fact and insure that his





Nuclear Propulsion Project

Aerial photo (top) shows assembly, maintenance and administration areas of Atomic Energy Commission's Nuclear Propulsion Project at National Reactor Testing Station, Idaho Falls, Idaho. Test in which first turbojet engine was powered exclusively by heat from experimental atomic reactor (AW Feb. 11, p. 34) was performed by General Electric Aircraft Nuclear Propulsion Dept. at facility. Cutout (middle) is of initial test area operated by GE's ANP department. As of one year ago, GE's ANP department employed 2,000 persons at Evendale, Ohio, and Idaho Falls. Nuclear turbojet engine was designed and built at Evendale and tried in test cell there on conventional fuel before being transported to Idaho Falls. Ralph M. Parsons Co., Inc., performed architect-engineering on all facilities shown.

It was apparent several years ago that unusual new materials would be needed for aircraft flying at supersonic speeds. These new materials would have to be unusually strong . . . they would have to operate at high temperatures . . . they would have to be resistant to corrosion . . . and they would have to be readily available, even in an emergency. It was apparent that steel was the only material able to satisfy all the requirements.

Will today's metal do for tomorrow's aircraft?

That's when United States Steel got busy. We began investigating the possibilities of all the stainless steels, and the constructional alloy steels as well, to learn how they could be modified to suit your needs.

Since then the numberless possibilities among all the alloy and stainless steels have been reduced to several. Our research continues, to refine existing grades even further, to develop new grades designed for optimum supersonic service. With the help of airframe manufacturers, we hope soon to find the answers.

If you would like to know more about the materials problems posed by modern high-speed flying, and the possible solutions, send for a copy of our new booklet, "Special Steels for the Aircraft of Tomorrow."

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requirements are not forcing the aircraft system too far out on this curve where the costs become prohibitive.

Design Needs

The scientific and technical community must press hard in a search for means to extend the useful portion of this curve.

The aerodynamicists must work on improvements in airplane lift over drag, particularly at supersonic speeds; the powerplant specialist must decrease specific fuel consumption of current engines and, for that matter, come up with new propulsion concepts that increase altitude and speed capabilities. The structural and material experts must learn how to live with the heat problems inherent in the increases in Mach number desired.

Engineers must learn to provide adequate handling qualities for manned aircraft and proper guidance for the unmanned missiles at higher speeds and altitudes.

The human factors engineers must continue to study the limitations of the pilot relative to these systems.

At the same time, the military planners must temper strategic and tactical doctrines to the weapon systems that can be made available to them. Anything that the military planner can do to reduce the total range required to perform a mission will result in considerable reduction in system complexity and cost. It is only by careful coordination between these groups that the simplest and least costly, as well as the most diversified, capability can be manned and funded.

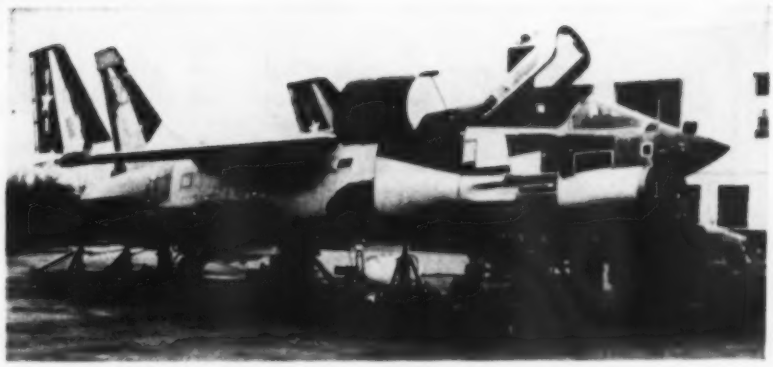
Our problem then in research and development, with respect to our stabilized budget, can be helped by rapid and competent early evaluation and by proper emphasis on close cooperation between the technical and military communities towards the simplest overall solution. In both these areas, our scientific advisors can be of great assistance and the Air Force I know welcomes their help.

Realistic Program

Although we can achieve an improvement in our overall research and development program by more rapid and more sophisticated evaluation and by striving to perform our mission in the simplest, most ingenious and least costly ways, we still have to have a realistic program that is not watered down to impotence and does not leave us with a capability 10 years hence that exposes this country to excessive danger.

There are many who feel that our present research and development program, in spite of the improvements I have suggested, will still require us to take undue chances in the development of new systems. We may be too optimistic and put all our hopes on the most advanced technical concept and end up with a weapon system hamstrung by problems of reliability. On the other hand, if we are too conservative we may end up with a weapon system incapable of survival in the next time period.

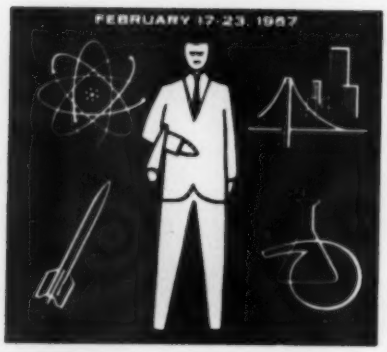
The correct answer can only come from a sophisticated and adequate research and development program. The improvements I have mentioned will help out and our scientific community, and our Air Force can act in concert in these areas, but, along with this, must come an improvement in the understanding of research and development in our upper political echelons. We cannot deliver military capabilities for the 1965-1970 period without funds no matter how clever we are—what is needed under the circumstances is a coordinated effort between the scientists, the military and the administration to achieve the proper balance. The future of this country is indeed hanging in the balance.



F8U-1 Handling Dolly

Handling dolly for transport and work facility on F8U-1 Crusaders after they leave the assembly line has been designed by Chance Vought Aircraft. Dolly, which also has been delivered to Navy, is designed for use for all production operations between final assembly and flight release. It makes possible checkout of all systems under simulated flight conditions with full power. Device eliminates airplane jacking for cycling of landing gear, dive brakes and other parts. All plane's surfaces can be operated, engine tested and cockpit check performed. Dolly also provides central point to connect shop air and electrical power. It opens like scissors for placement beneath airplane, has built-in hydraulic jacks and swiveling wheels to improve handling. Note hold-back fittings in bottom photo.

NATIONAL ENGINEERS' WEEK



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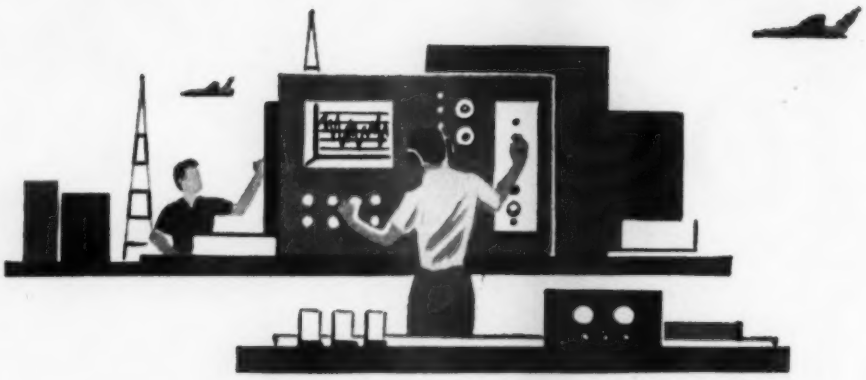

An engineer who leans toward what he calls the "practical" side of his work . . . a man who likes to get out in the field and see exactly what an equipment can or can't do and why . . . a man who appreciates keeping in touch with the operating results of his engineering thinking . . . in short, an engineer who prefers to apply the developments of his profession.

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March 20, 21—Ft. Worth
March 23, 24—St. Louis
March 25, 26—Kansas City

March 28, 29—Chicago
April 1, 2—Denver
April 5—Salt Lake City
April 8, 9—Columbus

April 10—Winston-Salem
April 11, 12—Detroit
April 13, 14—Dallas
April 17, 18—Atlanta

To arrange confidential interview when we are in one of the above cities—or in a mutually convenient area—send your resume, today, to:

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RCA Service Company, Inc.
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RCA SERVICE COMPANY, INC.

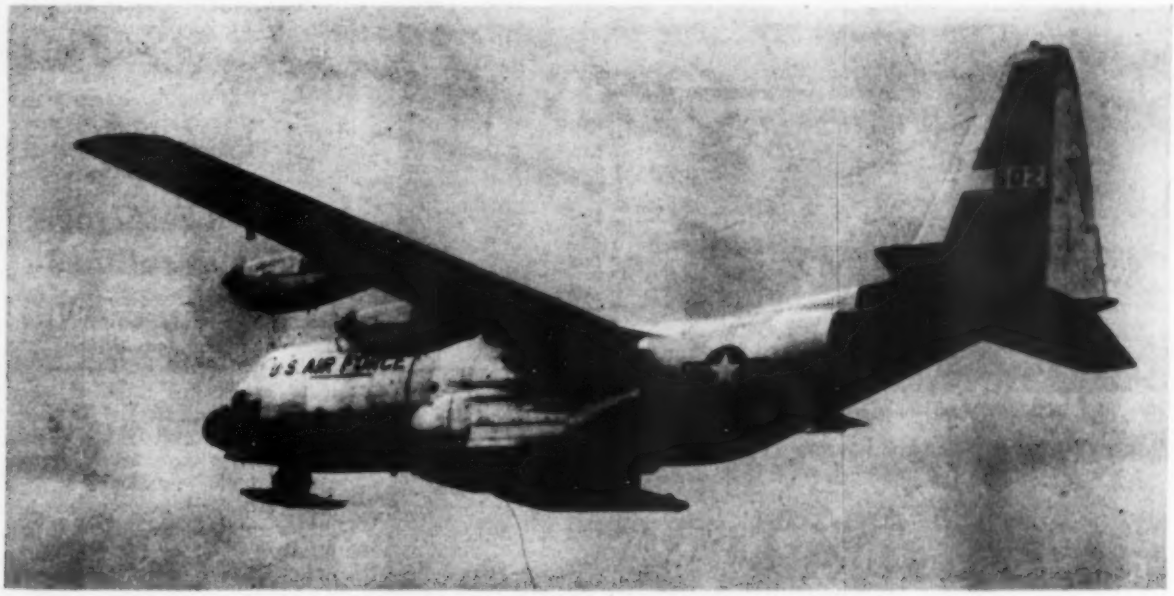
New F-104 Two-Seat Version

FIRST PICTURES of Lockheed F-104B indicate dual-place version of the Air Force's fastest fighter has been achieved with minimum increase in drag or alteration of handling qualities. The second seat has been added aft of the pilot with no increase in fuselage length, to maintain same basic dimensions as F-104A. Only penalty would be reduction in fuel capacity.

F-104B performance, which closely approximates that of single-place model, will enable it to be used as first-line tactical aircraft as well as for advanced training. This photo shows stall-warning instrumentation on nose ahead of Air Force lettering and wing leading edge in deflected position.

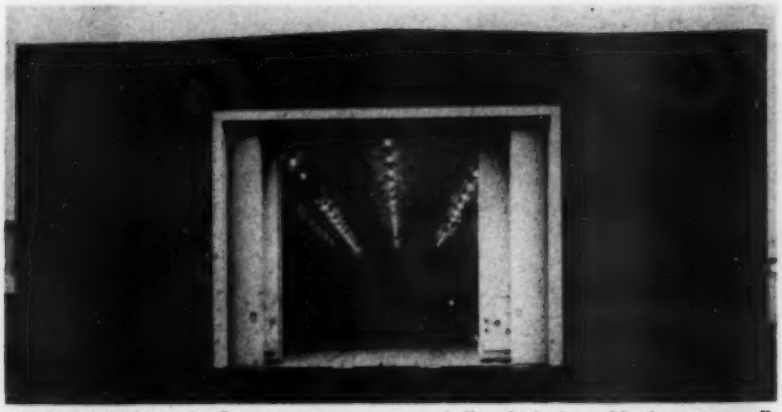
FIRST TAKE-OFF photo with only pilot aboard, emphasizes the thinness of the wing and horizontal tail. Upper aft portion of the vertical tail, which is integral with the one-piece horizontal surface, is shown as it moves over the vertical fin.

Arma inertial systems provide tactical aircraft with "all-weather" capability. If you are interested, contact Arma Garden City, N. Y. A division of American Bosch Arma Corporation.
ARMA



C-130 Skis Tested With Television

Ski-and-wheel version of Lockheed C-130 Air Force cargo-troop carrier (AW Feb. 11, p. 83) is undergoing rigid tests at Marietta, Ga., and Bemidji, Minn., with aid of Farnsworth 600A camera with wide angle lens affixed to right wing (middle picture). Camera is suspended in a two-foot fiberglass pod under wing. Focus is fixed on the 19½-ft. 1,700-lb., main skis and smaller nose skis, which are candy-striped for better visibility. Coaxial cable (drawn on wing) runs from the camera into the cabin. Flight test engineers inside the compartment watch the behavior of the skis at various speeds and attitudes, using a 10-in. monitor screen. Top is a flyover shot showing the skis-down configuration, bottom is skis-up as airplane taxis. C-130 project, powered by four Allison T56 engines with a total of 15,000 hp., is world's largest ski-equipped airplane, will be used for heavy duty hauling, cargo dropping, as an ambulance, paratrooper airplane, and for polar operations.



DOUBLE DOORS seal off inner, outer concrete shells which form Northrop test cell.

SNARK STRUCTURE housing J57 engine in nacelle at bottom is positioned in test cell with aft end projecting into exhaust duct. Wall is faced with corrugated steel.

Test Cell Cuts Jet Noise 98%

Los Angeles—Test cell, now in operation at Northrop Aircraft, Inc., has been engineered to reduce jet engine noise by more than 98%.

Accommodating the Pratt & Whitney J57 as it is mounted in the aft portion of the Northrop Snark SM-62 pilotless bomber, the test cell was designed by Pereira & Luckman, architectural and engineering firm, and Paul Veneklausen, acoustical physicist affiliated with P&L as consultant.

To attain adequate sound attenuation of the roar of the jet blast, particularly in the low frequency range, an original arrangement of "stagger tuned shunt resonators" was devised by P&L and Veneklausen.

Each of 28 resonators was designed to eliminate a series of frequencies until the low frequency sound spectrum of the J57 exhaust blast was covered. These resonators are air cavities varying in width and from 8 to 24 ft. long, located between concrete fins radiating from the test building's exhaust duct.

Each resonator cavity traps the corresponding sound frequency, forming a low impedence at the mouth of the resonator and a high impedence at the closed end. This, in effect, causes the trapped sound energy in the resonator to be translated into heat energy. Result of this treatment, coupled with that for the intake and compressor sound, is a 98.6% reduction of noise.

Test cell construction incorporates inner and outer reinforced concrete shells. Inner shell of the cell is faced with corrugated steel. Cement intake ducts, flush with the structure's interior near the entrance, carry air from roof height down to a right angle turn at floor level. These ducts are lined with Soundstream Fiberglas, an acoustically absorbent material, formed in a zig-zag pattern, to effectively blanket most of the high frequency sound.

Whine of the engine compressor blades is partially contained by the concrete mass of inner and outer shells and the air gap between them.

Test cell structure contains 6,320 sq. ft. Costing $440,000, it may be adapted for jet engines up to 30,000 lb. thrust.

Adhesive Structures Problems Outlined

Los Angeles—Design and production problems of adhesive bonded structures in aircraft and some companies approaches and solutions were outlined recently at the first technical meeting sponsored by the Society of Aircraft Materials and Process Engineers (SAMPE).

A feature of the sessions was presentation of papers on Swedish, French and Canadian progress in bonded structure utilization.

Among session highlights were:

- **A paper** of the various parts of bonded structure used in the Hughes GAR-1, Falcon air-to-air guided missile.
- **History** of research and development and tests leading up to the use of adhesive seal in addition to rivets on faying surfaces in the F-102 wing integral fuel cells.
- **A motion picture** showing investigation at Convair, Ft. Worth, of high intensity sound damage to panels from jet engine exhausts. While the J79 turbojet which powers the B-58 was not shown, the mockup indicated full scale tests on engine installations on the underside of the Hustler wing of both outboard and inboard engine pod installations.

In the B-58 application, all exterior metal surfaces are honeycomb sandwich, utilizing aluminum and stainless steel skins and aluminum, glass fiber and stainless cores. All sections are bonded except where stainless sections subject to high temperatures indicate a need for brazed structure. Thus, on the wing underside, aluminum sandwich is used where heat damage is not a factor, while those parts subject to engine exhaust blast (all along the trailing edge of the delta wing), are stainless steel skin and core.

The Falcon uses a magnesium frame for its stabilizers and control surfaces, with a glass fiber laminate skin. Expansion coefficient differences result in those sections of the skin which are unsupported by framework, having an inward buckle after a cure process which has been adjusted to produce this effect.

Reasons for the inward buckle were given as better stress patterns before the missile is subjected to aerodynamic heating in flight, and a better bonded structural strength when the

missile is at elevated temperature during flight.

In addition to the stabilizers, the small radome nose on the Falcon also is bonded structure.

Convair found in its early investigations that using a rivet patented in 1929 by two Consolidated Aircraft employes, along with the proper adhesive sealant, produced an integral wing fuel cell which has been subjected to intense comprehensive testing and remained pressure tight at low and elevated temperatures. Low temperatures, which produced a coat of frost on the wing section in the warm sun where it was tested, were obtained by cooling the fuel with liquid carbon dioxide while it was in the adjacent reservoir, then pumping it through the wing with three aircraft fuel pumps.

The rivet is known as the Strayler rivet, for its inventors, Taylor and Strachan. Used with an .004 thick shim, it can be driven by hand by semi-skilled mechanics and will produce a satisfactory seal. Design is such that precision counterbore is necessary and rivet heads are milled to produce a smooth aerodynamic surface after driving.

In materials and processes session, Hexcel Products indicated promising new core materials with much better strength characteristics at temperature are being developed. One approach uses asbestos as the core base, while the other, with still higher temperature potential, but needing much research and development before it is commercially applicable, is silicone base core material.

Bryan Noton, senior scientific officer at the Aeronautical Research Institute of Sweden presented a paper detailing research there on bonded structure. While not new in content, the aspect of the paper which produced a marked effect on those attending the conference was the fact that Swedish research in sandwich panels had been conducted in a period of just 16 months, with a total

Old and New Versions

OLD (above) and new (right) versions of Hiller flying platform prototypes. First was twin-engined version backed by the Office of Naval Research, new one is three-engined platform built under $500,831 development contract for Army (AW Jan. 21, p. 107). Plans are to use the flying platform not only as carrier for one man but for troops and supplies.

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staff of two persons in addition to Noton.

Only part of the program farmed out was fabrication of the test panels, handed to the SAAB factory. Total budget for the entire program, which those attending the conference said was equal to five years work, hundreds of thousands of dollars and large staffs of American plants, was just $90,000.

British to Build New Bomber for Navy

London—Blackburn and General Aircraft has received a development contract for a supersonic twin-engined bomber for the Royal Navy, the NA39.

A company spokesman says the contract requires an increase in the firm's facilities for research and development at transonic speeds and advanced work on low landing speeds. No details of the aircraft have been released but presumably it would be equipped with some type of boundary layer control.

The Royal Air Force also is said to be interested in the new strike aircraft as a possible successor to the Canberra.

The company says the greater part of its design and experimental capacity is being taken up with the new aircraft.

"We are designing and building with our own resources a high-speed tunnel to supplement the low-speed tunnel we have had for many years, which will enable us to cover speeds up to a Mach number of 1.5 and later probably to still higher speeds," the firm revealed.

A spokesman said the company is going forward with the latest developments in integral construction, in which structure "is machined from the solid," as well as necessary electronic engineering.

Blackburn and General builds the RAF Beverley transport and also handles some subcontract work for the Bristol Britannia.

Only this week, Blackburn Dumbarton, a subsidiary of Blackburn and General which handles subcontract work for the Britannia and Beverley, announced it was laying off more than 250 workers.

"At the moment we have no work although we are trying desperately to get more orders," a spokesman for the company said. He blamed the layoffs on the "degenerating position in the aircraft industry as a result of the defense cuts."

If the Ministry of Supply follows current procedure, the development order would call for about 20 aircraft.

A high Blackburn official expects the new supersonic aircraft to go into production in "fairly substantial quantities." He says it will be a versatile machine.

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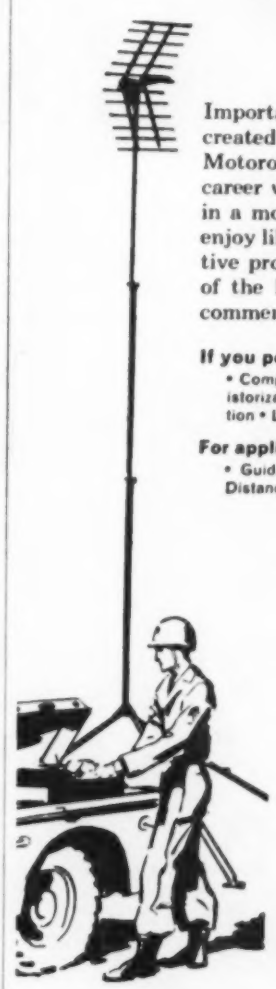

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Parker Buys Two West Coast Firms

Cleveland-Parker Appliance Co., Cleveland, purchased Franklin C. Wolfe Co., Culver City, Calif., and The Mathewson Corp., Los Angeles, for approximately $1 million.

Wolfe is developer and producer of several types of patented sealing devices which have a market in the aircraft and electroninc industries where leakless sealing is essential.

Mathewson manufactures precision metal parts, certain of which are essential components of the Wolfe sealing devices.

Together the two employ over 200 persons and do an annual business in excess of $3 million, mostly in the military field.

Mathewson Corp. will be moved from Los Angeles to a new plant, now under construction, adjacent to that of the Wolfe company.

Together the firms will be operated as a division of Parker Appliance under the name of the Franklin C. Wolfe company.

Franklin C. Wolfe, who has been president-treasurer of his firm since its establishment in 1945, has been named president of the new division. All other officers and personnel of the two companies will be retained.

Parker Appliance is a major producer of synthetic rubber O ring seals in addition to a number of other fittings and parts for the aviation industry.

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Ryan Firebee Target Drone Sets Records

Alamogordo, N. M.—A Ryan XQ-2B "firebee" jet target drone has set unofficial world's records of 53,000 ft. and 104½ min. of flight under remote control in tests at Holloman Air Development Center here.

Another Firebee recently set another unofficial record for remote-controlled target drone flight by flying 152 mi. from the control station and back, the Air Research and Development Command said.

Design altitude for the operation Q-2A Firebee is 40,000 ft. The XQ-2B, built by Ryan Aeronautical Co. and powered by an improved Continental J69 engine, features a high altitude wing with a revised leading edge and an increase in area of approximately one-third.

It also has an improved control system incorporating glide and automatic climb and dive control.

A new autopilot designed by Ryan allowed remote control of a 7½-min. powerless glide following the 97 min. of powered flight. The XQ-2B was recovered by its parachute release system.

Bell Aircraft Buys Lake Erie Corp.

Buffalo, N. Y.—Bell Aircraft Corp. has purchased the Lake Erie Engineering Corp. in a transaction involving cash and Bell stock. No amounts were specified. Under the arrangement, Lake Erie becomes a wholly-owned subsidiary of Bell.

There will be no changes in the management, personnel, policies or products of Lake Erie, Bell said. Lake Erie Engineering of Buffalo, is manufacturer in the hydraulic press field.

Robert E. Dillon will continue as president of Lake Erie. It is expected that Leston Faneuf, president of Bell, will be named Lake Erie board chairman.

De Havilland Wants Canadian Shares Back

Toronto—Canadian shareholders of de Havilland Aircraft of Canada Ltd., Toronto, are being offered $200 per share for their stock by de Havilland Holdings Ltd., parent company. Cur-

rent market value: $185 bid and $198 asked.

The English company holds over 92% of the outstanding shares, and all shares of other de Havilland subsidiaries. The parent company wants to obtain all Canadian shares because it feels that with complete ownership it can best cater to the ever increasing complexity of the aircraft industry, involving long-term decisions with consequent financial and commercial risks.

Its offer of $200 per share is good to Feb. 28 through the Royal Trust Co., Toronto.

The move is in contrast to that of A. V. Roe Canada Ltd., an English-owned company, in making available to Canadian shareholders 500,000 shares, comprising 10% of the stock of the Canadian subsidiary.

Equity ownership of Canadian companies by foreign capital is a controversial issue in Canada, and some proposals have been made to encourage a Canadian share in ownership of subsidiaries through government action—tax benefits, for example.

British Sell India 68 Canberra Jets

London—India has signed a contract for 68 British Canberra jet bombers. The contract including spares is believed to be worth more than $56 million.

The Indians ordered 54 Mark VIII bombers, eight Mark VII photo reconnaissance aircraft and six Mark IV dual control trainers. The bombers will be built at the English Electric factory at Preston. Deliveries are to begin this spring.

The sale was concluded after three years of negotiations despite strenuous efforts by the Russians to interest India in Ilyushin-28 bombers.

Meanwhile government contracts for Mark IX photo reconnaissance Canberra jet bombers are being transferred from English Electric to Short Brothers and Harland Ltd., of Belfast.

The action follows the sale to India of the Canberras and the placing of production orders for P.1 fighters for the Royal Air Force. The aircraft in these Canberra and P.1 orders will be produced at English Electric's Preston plant.

First Boeing KC-125 Stratotanker Delivery

First Boeing KC-135 Jet Stratotanker has been officially delivered to USAF. Airplane is undergoing Phase III flight testing, flight crew indoctrination, at Edwards AFB, Calif.

KC-135 will replace piston-powered KC-97s in SAC.

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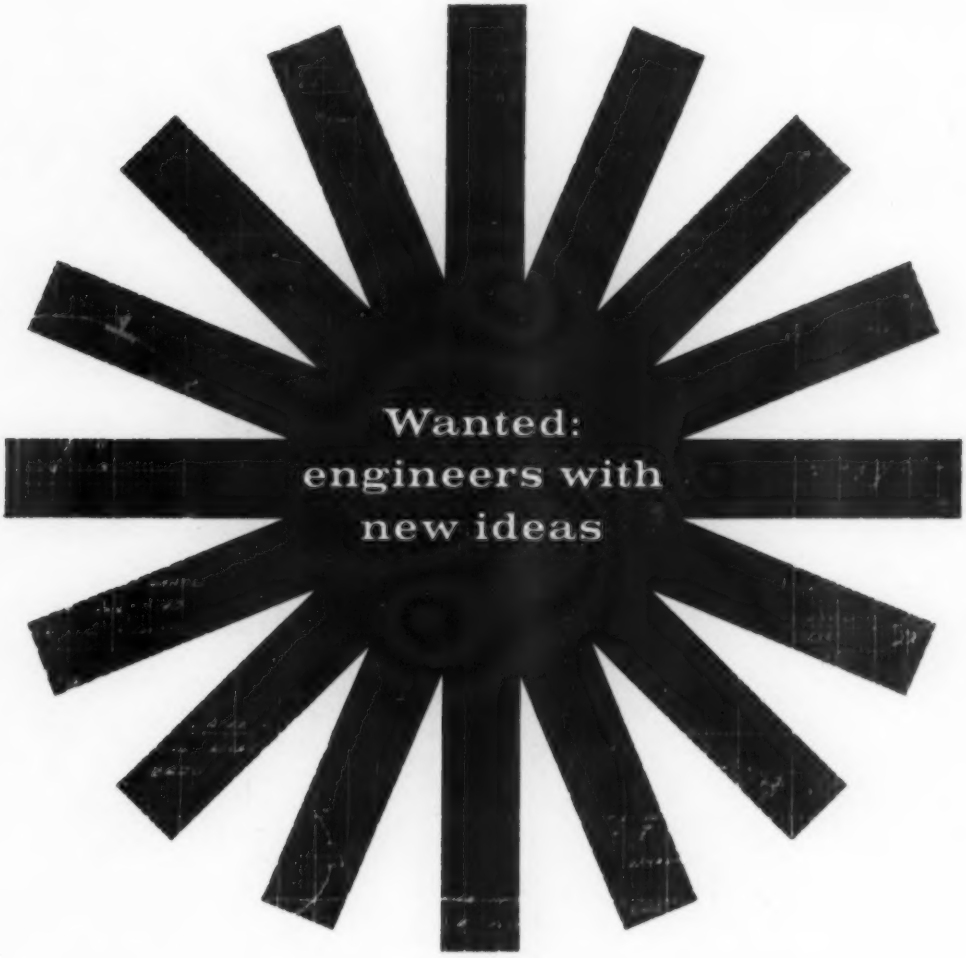
R&D Contracts Awarded 1954-56

Washington—Following is a list of the 300 companies and institutions receiving the largest amounts of military research and development contracts in the fiscal years 1954-56 as prepared by the House of Representatives Select Committee on Small Business from reports supplied by the Department of Defense:

(In thousands)	
North American Aviation	$420,712
General Electric Co	338,102
Western Electric Co	264,195
Boeing Airplane Co	211,567
Hughes Aircraft	203,009
General Dynamics	146,978
Martin, Glenn L., Co	136,225
Bell Aircraft Corp	133,723
Aerojet General	115,074
Westinghouse Electric	105,483
Northrop Aircraft, Inc	105,174
Curtiss-Wright Corp.	98,426
Radio Corporation of America	87,639
Lockheed Aircraft Corp	84,253
Sperry-Rand Corp.	83,230
Raytheon Manufacturing Co	70,844
United Aircraft Corp	67,373
Radioplane Co.	57,572
General Motors Corp	42,254
International Business Machines	39,761
Douglas Aircraft Co., Inc	39,449
Avco Manufacturing Co	37,206
Chrysler Corp., Plymouth	34,717
Bendix Aviation Corp	34,289
McDonnell Aircraft Corp	32,396
Chance Vought Aircraft	31,708
Republic Aviation Corp	29,530
Fairchild Engine & Airplane Corp.	24,810
Minneapolis Honeywell	23,906
International Telephone & Telegraph	22,802
Olin Mathieson	21,799
Consolidated Vultee	21,685
Sylvania Electric	21,315
Thiokol Corp.	21,264
Philco Corp.	19,953
American Machine & Foundry Co.	19,288
ACF Industries	19,225
Ryan Aeronautical	16,944
Aro, Inc.	16,311
Hercules Power Co	16,024
Reaction Motors	14,942
Ford Motor Co	14,854
Goodyear Tire & Rubber Co	14,363
Marquardt Aircraft Co	14,329
Collins Radio Co	14,275
Piasecki Helicopter	14,235
American Telephone & Telegraph	14,200
Ramo Wooldridge Corp	14,168
Melpar, Inc.	13,524
Vitro Corporation of America	13,078
Eastman Kodak Co	12,923
Continental Aviation	12,610
Cook Electric Co	12,413
Rheem Manufacturing Co	12,142
Gilfillan Bros., Inc	11,873
Motorola Comm.-Electric	11,508
Callery Chemical Co	11,356
Aerophysics Development Corp.	11,006
Detroit Controls	10,733
American Bosch Arma Corp	9,818
Parsons, Ralph M., Co	9,330
Illinois Institute of Technology	9,036
Maxon, W. L. Corp	8,988
Northern Ordnance, Inc	8,458
Grumman Aircraft Engineering	8,258
Stroukoff Aircraft Corp	8,231
Burroughs Corp.	7,991
Airborne Instrument Laboratory	7,399
Stavid Engineering, Inc	7,162
General Mills, Inc	7,082
Glenco Corp	6,858
Radiation, Inc.	6,850
Garrett Corp.	6,814
Phillips Petroleum Co	6,647
Hallicrafters Co.	6,298
Belock Instrument	6,292
Kearfott Co., Inc.	6,283
Aircraft Armaments	6,064
All American Engineering	5,997
Cubic Corp.	5,971
Coleman Engineering Co	5,875
Reeves Instrument Corp	5,715
Pachmayr Corp.	5,141
Emerson Radio	5,037
General Tire & Rubber Co	4,943
Rohm & Haas Co	4,933
Continental Motors	4,876
Land-Air, Inc.	4,876
Link Aviation, Inc.	4,728
Firestone Tire & Rubber Co	4,697
Food Machinery & Chemical Corp.	4,615
Century Engineering, Inc	4,570
Perkins-Elmer Corp.	4,527
Electronic Engineering Co	4,466
Metal Hydrides, Inc	4,388
Magnavox Co.	4,249
Beech Aircraft Corp	4,106
Sverdrup Parcel Inc	4,053
Bulova Research Laboratory	4,048
Du Mont (Allen B) Laboratories	4,030
Eagle Picher Co	3,941
Lab for Electronics	3,924
Hazeltine Electric Corp	3,889
Horning Cooper, Inc	3,862
Sanders Association	3,864
Clevite Corp.	3,832
Little, A. D., Inc	3,723
Norden Ketay Corp	3,711
Norden Labs	3,690
Engineer Research Association	3,574
Continental Electronics Manufacturing Co.	3,517
Varian Association	3,294
Michigan State College	3,276
Polytechnic Institute of Brooklyn	3,260
Armour Laboratories	3,231
Vertol Aircraft Corp.	1,555
Consolidated Electrodynamic	1,547
Stewart Warner Corp.	1,544
Pacific Car & Foundry	1,516
Instruments for Industry	1,511
Technical Operations, Inc.	1,508



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Fairbanks, Morse Co.	1,448
Associated Engineers	1,412
Grand Central Rocket	1,411
Smith (A. O.) Corp.	1,410
Haloid Co.	1,384
Air Reduction Co., Inc.	1,359
Fairchild Camera	1,358
Thompson Products, Inc.	1,358
Bomac Laboratory	1,335
Allis-Chalmers Manufacturing	1,331
Globe American Corp.	1,329
Reflectone Corp.	1,313
Norris Thermador Co.	1,309
Bowen McLaughlin	1,263
Washington University	1,256
Union Carbide & Carbon	1,236
Telecomputing Corp.	1,208
Temco Aircraft Corp.	1,193
Allied Research Assoc, Inc.	1,179
Farrand Optical Co.	1,153
Ten Bosch M., Inc.	1,153
General Electric Supply Corp.	1,150
National Fireworks, Inc.	1,146
Brooks Perkins, Inc.	1,118
Alloy Engineering & Casting Co.	1,115
Cessna Aircraft Co.	1,111
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Merganthaler Linotype	1,089
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Litton Industries	3,185
Librascope, Inc.	3,163
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Jackson & Church	2,232
Wetmore Hodges & Association	2,204
Hoffman Labs, Inc.	2,113
Atlantic Research Corp.	2,102
Bermite Powder Co.	2,096
Parson Aerojet	2,087
Reynolds Metals Co.	2,061
Carnegie Institute of Technology	2,048
Daystrom Electric Corp.	2,042
Aeronautical Radio	2,022
A. R. F. Product, Inc.	2,009
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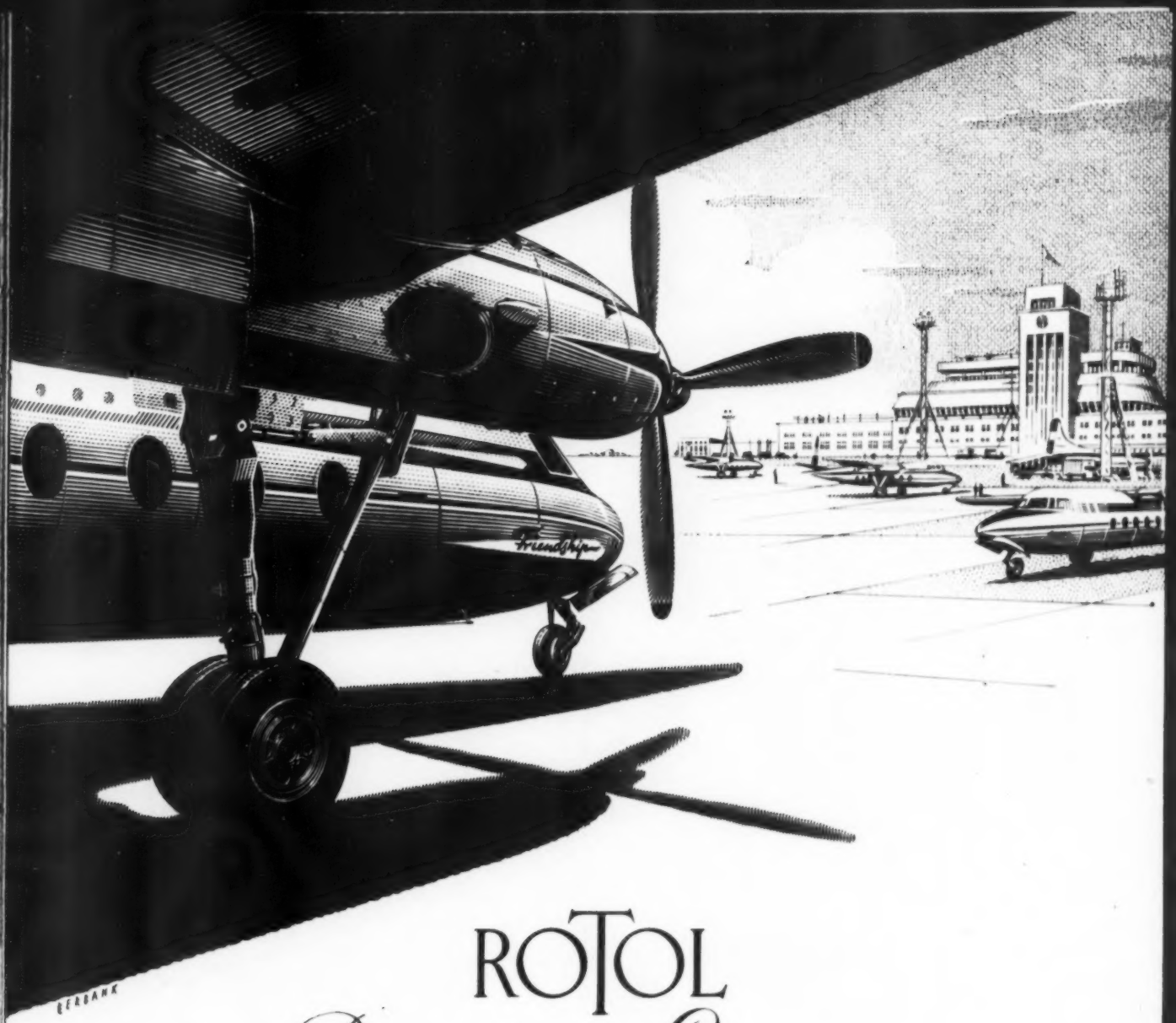

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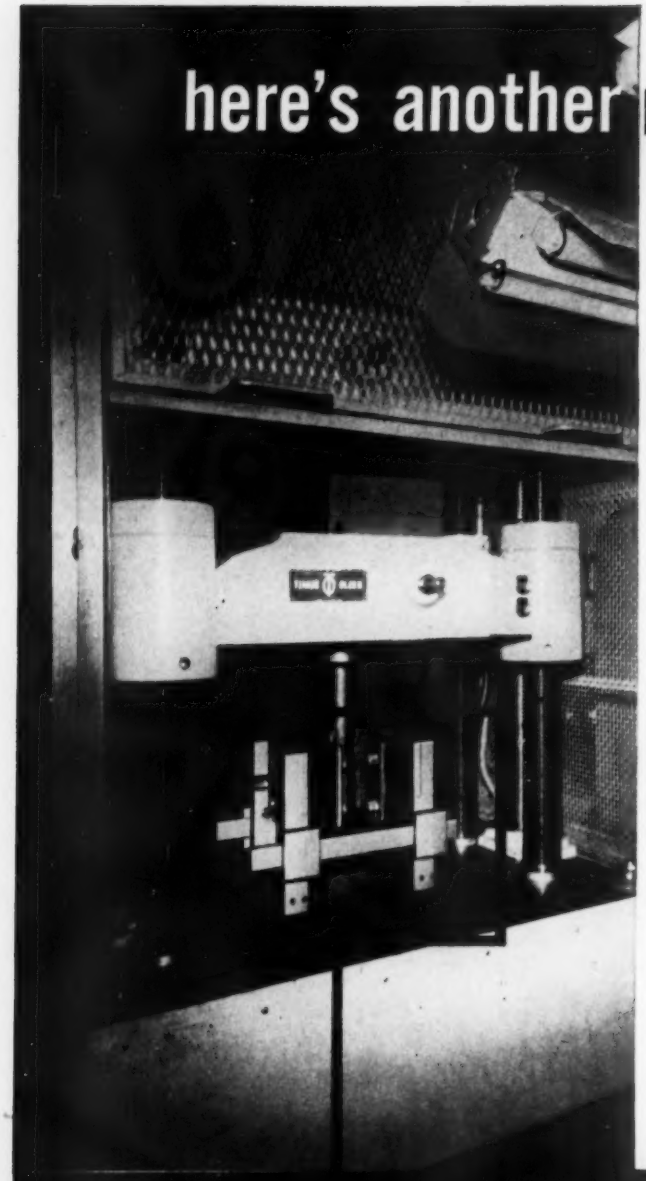

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Stanley Aviation Corp.	1,720
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Technitrol Engineering Co.	1,680
Horizons, Inc.	1,675
Kaman Aircraft Corp.	1,669
RCA Service Co.	1,642
Jered Industries	1,637
Lenkurt Electric Co., Inc.	1,623
International Harvester	1,604
Hamilton Watch Co.	1,594
Technical Products Co.	1,592
Thiebolt Aircraft	1,576
Austin Co.	1,558
Four Wheel Drive Auto	945
Titanium Metals Corp. of America	934
Designers for Industry	917
Edgerton, Germeshausen & Grier	914
Air Products, Inc.	913
H. L. Yoh and Co.	903
Total 239 firms	1,066,742
Mass. Institute of Technology	$61,169
Calif. Institute of Technology	50,673
Johns Hopkins University	38,695
Cornell Aeronautical Laboratory	24,814
Rand Corp.	21,462
University of Michigan	16,023
Columbia University	11,576
Stanford University	10,201
University of California	9,865
Battelle Memorial Institute	9,794
University of Illinois	9,290
Illinois Institute of Technology	9,036
U. S. Atomic Energy Commission	8,779
University of Chicago	8,135
University of Minnesota	8,122
Stanford Research Institute	7,442
University of Texas	5,996
Ohio State University	5,760
University of Pennsylvania	5,251
George Washington University	5,091
Pennsylvania State College	5,060
New York University	4,569
Princeton University	4,388
Harvard University	4,261
Woods Hole Oceanographic Laboratory	3,904
Franklin Institute	3,741
Armour Research Foundation	3,424
Michigan State College	3,276
Polytechnic Institute of Brooklyn	3,260
Armour Laboratories	3,231
U. S. Department of Commerce	3,163
National Academy of Sciences	2,796
University of Denver	2,795
Cornell University	2,654
University of Washington	2,519
Southwest Research Institute	2,244
New Mexico A. & M.	2,081
Carnegie Institute of Technology	2,018
Georgetown University	1,932
Midwest Research Institute	1,896
Yale University	1,657
Purdue Research Foundation	1,607
Boston University	1,516
University of Dayton	1,475
Brown University	1,469
University of Florida	1,406
Syracuse University	1,309
University of Wisconsin	1,308
University of Maryland	1,307
Case Institute of Technology	1,279
Tufts College	1,267
Washington University	1,256
American Institute of Research	1,198
New Mexico Institute of Mining and Technology	1,198
Duke University	1,177
Georgia Institute of Technology	1,164
University of Utah	1,136
Georgia Technical Research Institute	1,124
University of Alaska	1,102
University of Southern California	1,077
University of Colorado	1,029
Total, 61 firms	412,828

[1]Amounts for the 3 fiscal years are comprised of contracts awarded and other procurement actions, in amounts of $50,000 or more in the fiscal year 1954 and in amounts of $10,000 or more in the fiscal years 1955 and 1956.

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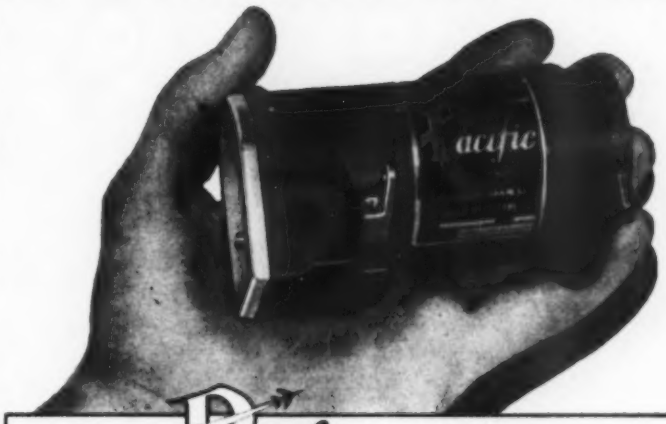

with Pacific's fully automatic multi-directional protection!

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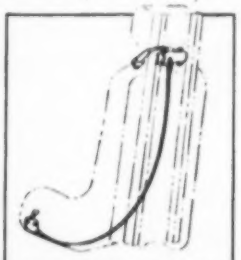
Made to the absolute minimum weight, the reel alone is only 1 pound, and is the smallest overall package available. It is designed especially to put the shoulder harness reel logically out of the way of ejection seat mechanisms and other equipment, by its convenient location on the seat head rest. It permits easy initial installation, fast harness attachment and can be used with integral suit harnesses when they are available.



A typical head rest installation showing the reel, manual reset lever and cable.

Fully self-contained, the HR-40 needs no electrical, hydraulic, or other external accessories to operate, and is absolutely unaffected by temperature, vibration or the position of the aircraft. The entire reel is fully tested and built to conform to Air Force Specifications MIL-R-8236, type MA-6.

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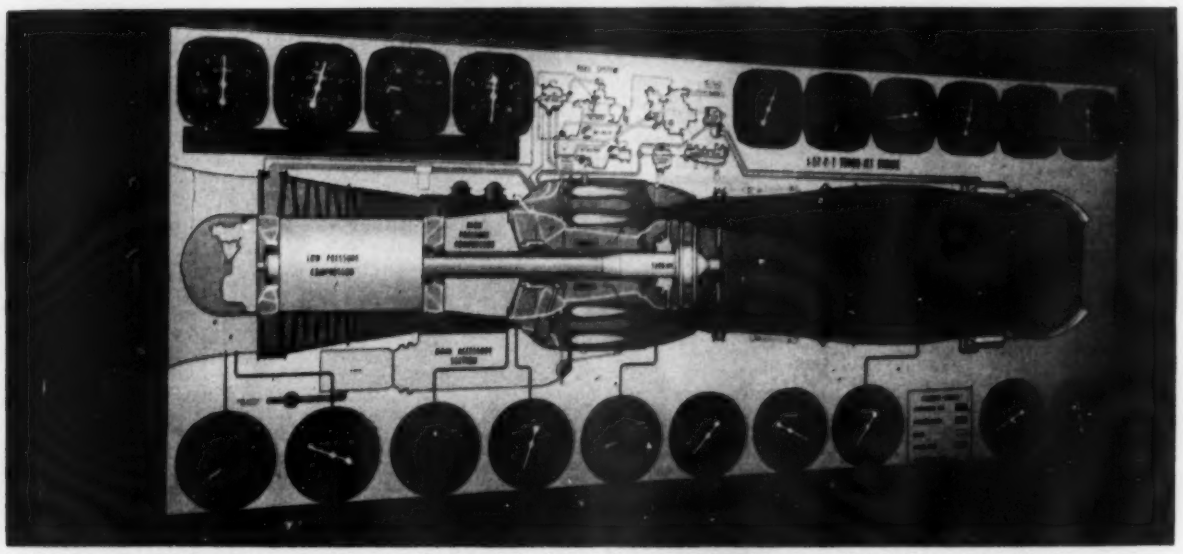
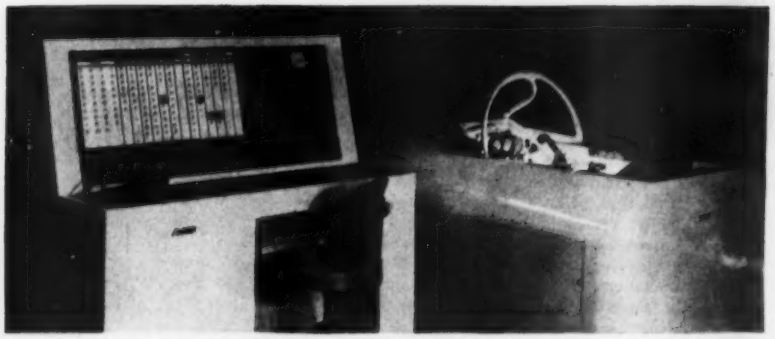


J-57-P-7 jet engine demonstrator used by the Air Force's Technical Training Wing, Chanute AFB. Device is trouble-free.

Complex Aircraft Demand Simulators



T-33 procedure trainer being built for USAF. Instructor's console (left), trainer (right).

ONE of four DC-6/7 procedure trainers built by BR for American Airlines. Instructor is at left, then flight engineer, captain and co-pilot. Device simulates engine noise.

By George L. Christian

Cincinnati, O.—The inexorable increase in complexity of aircraft systems—particularly avionic and jet engine control—is creating three major trends in the field of training requirements for air crew and ground crew alike.

- **Training aids,** whether simple, $100 mobile panels or complex, $1-million electronic flight simulators, are becoming absolute necessities.
- **Intermediate flight crew** training devices such as procedure trainers—more sophisticated and realistic than simple panels, but less costly and complex than full-fledged simulators—are becoming more prevalent.
- **Training courses** for ground crews—trouble-shooters and line mechanics—will have to teach the men to rely less on their tool boxes and more on their heads. They must be capable of correctly diagnosing such near intangible malfunctions as an intermittent short in an avionics system or a compressor surge in a turbojet powerplant.

Yardstick of Complexity

These and other trends, plus some prognostications, were brought out at the Second Training Symposium held here recently by Burton Rodgers-Technical Training Aids, Inc. The meeting was attended by more than 80 engineers, technicians and pilots representing domestic and foreign airlines and government agencies. The Air Force and Navy also was well represented.

Evidence of the high degree of complexity of modern avionics equipment and of modern turbojet engines include:

• **Sperry's K-type radar** bombing-navigation system used on B-47 and B-52 jet bombers contain some 70,000 parts, including almost 500 vacuum tubes, 100 relays and some 50 motors.

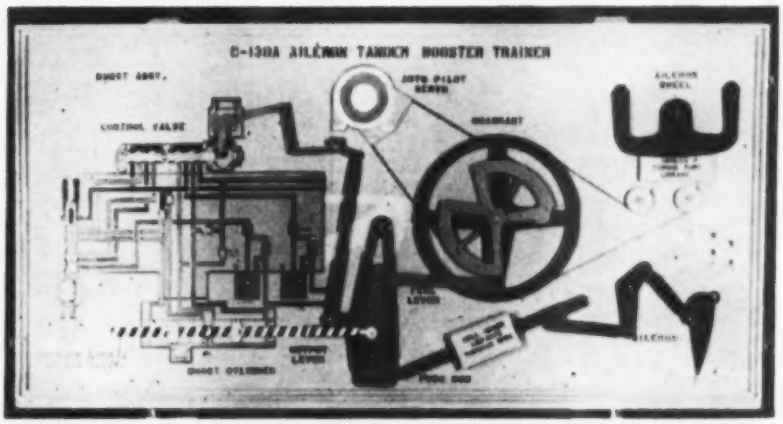
• **Pratt & Whitney Aircraft's** JT3 (J57) twin-spool jet engine, which powers such planes as the B-52, F-101A and F-102A, incorporates over 3,700 separate air foils, making it one of the most complicated aerodynamic machines in the world. It required over $100,000,000 and eight years to develop.

To meet these trends, several solutions have been evolved.

• **Airlines such as American,** long a hold-out against electronic flight simulators are contracting to buy such simulators for its Douglas DC-8 and Lockheed Electra gas turbine-powered transports. And the USAF will probably buy simulators for all of its large, multi-engine aircraft.

• **Companies such as Burton Rodgers** are being asked to build increasing numbers of intermediate type trainers, such as procedure and physical parts trainers, for both the military and for commercial airlines.

• **Manufacturers of gas turbine** powerplants, such as Allison and General Electric, have established formal training courses to teach airline flight and ground crews how to operate, trouble-shoot and maintain the engines which will power many of tomorrow's transports. P&WA and Westinghouse also are working towards this goal.



ANIMATED panel used to illustrate C-130A Hercules aileron tandem booster system.

Gas Turbine Courses

C. E. Martin, Allison's representative, told the meeting his company was prepared to back the airlines to the hilt to provide basic knowledge and training on its 501D turboprop engine going into use with the Lockheed Electra transport.

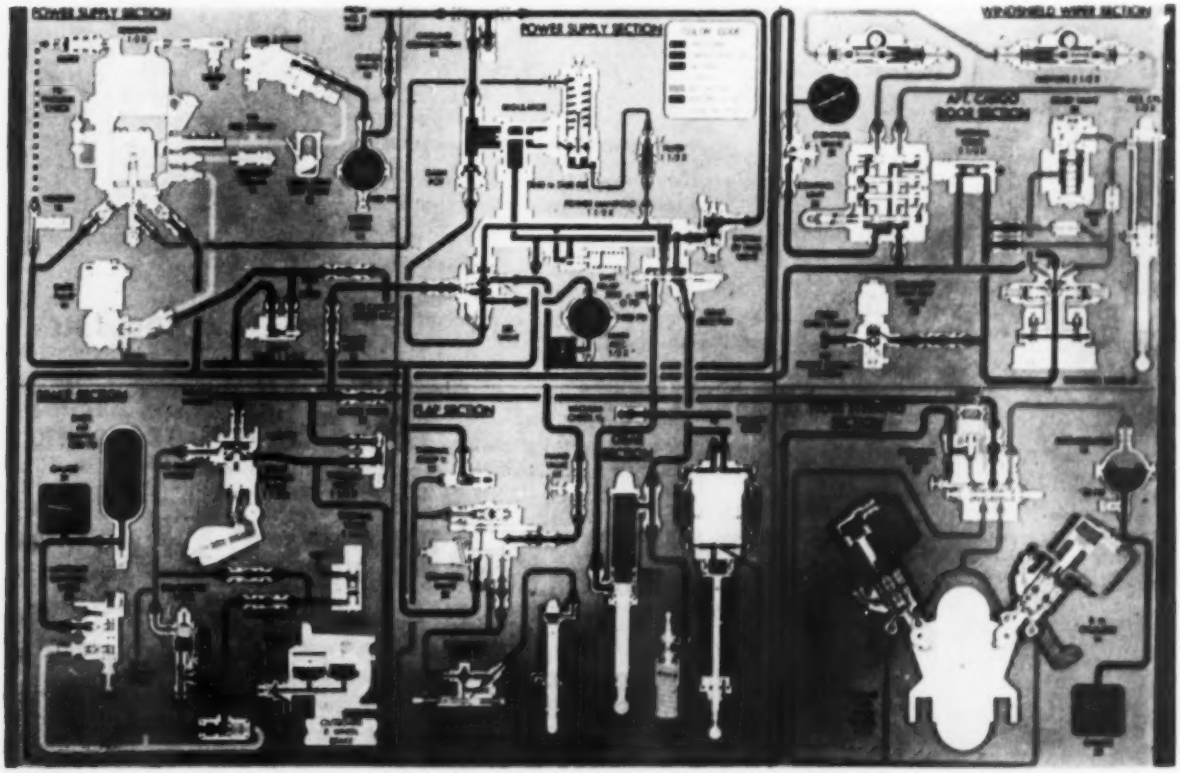
Allison is establishing these three programs to support its product:

• **Four-week training** program for maintenance mechanics.

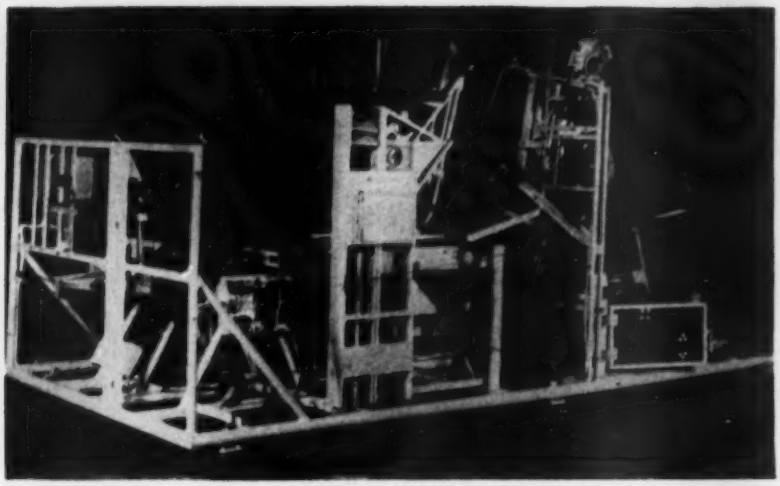
• **Four-week instruction** course for overhaul mechanic personnel. This also will include training on how to overhaul engine accessories if the accessory manufacturer does not provide such a service. He added that the only accessory manufacturer now providing this training is Bendix Products on its gas turbine fuel control units.

• **One-week training** program for flight crew members.

A. E. Langhorst, of GE, said that his



OPERATION of complete DC-6/6A hydraulic system is demonstrated by animated panel built by Burton Rodgers for American Airlines. Note how sections are grouped.



MARTIN P5M flight control trainer includes electrical, hydraulic and mechanical functions.

company is tailoring a three year training program on the CJ805 (J79) turbojet to airline requirements. The engine will power Convair's new four-jet 880 transport.

- **In 1957,** GE will provide general-type training in the field—at airline maintenance and overhaul bases. The training will be as closely related to the 805 as security will permit.
- **In 1958,** a typical-type training program will be as detailed concerning the 805 as security will allow.
- **In 1959,** GE hopes to be able to bring airline engine mechanics to Evandale for unrestricted, detailed instruction on the engine.

He added that GE's latest training aid, a scale plastic model of a jet engine (AW Jan. 14, p. 65) was cheap. Cost is but a fraction that of a live engine, it is light and easy to transport, and it is simple to modify to different dash numbers of a given model engine.

W. W. Doolittle, of P&WA, did not outline a formal jet engine training program for his company. He did, however, repeatedly stress the need for a thorough training syllabus for jet engine mechanics. Reason, he said, is that "the thermal and aerodynamic complexity of an advanced jet engine in the J57 class far outweighs its mechanical simplicity."

Reputation at Stake

He added that, "since the air transport industry of the world is staking its enviable reputation on the gas turbine engine, P&WA, as one of the major airline jet engine suppliers, stands willing and able to help the airlines in every way possible." He said that his company's field engineers and service department are ready to lend a hand whenever needed.

Training is the only variable in the formula of the jet area, Doolittle continued. He believes that the airline which spends the most training hours per man is the airline most likely to lick jet age growing pains.

A major problem facing the airlines is the fact that they are going to start their gas turbine teething on some of the most complicated engines ever built. This is contrary to the experience of the military, who started with the first, and therefore very simple, jet engines

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Write Mr. H. H. Miller, Assistant to Executive Engineer

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and grew up with the powerplants as they became progressively more complicated. The military now have a full 10 years background of jet engine experience.

Doolittle conceded that the actual maintenance of a jet engine is easier than that of a high-powered piston engine. But he does not believe that an average mechanic can maintain an advanced jet engine with only piston engine training techniques.

Problem is that troubles will now be in the field of thermodynamics and aerodynamics instead of being purely mechanical. As he put it, "a jet engine problem is often invisible. When a malfunctioning engine is disassembled, every component may look perfect. Therefore, to the jet engine mechanic, tools are less valuable than thinking, reasoning and understanding the facts, figures and fundamentals of engine performance."

To properly understand a jet engine's performance, Doolittle suggested that mechanics be schooled in physics at a high school level. He should understand the fundamentals of gas laws, thermodynamics, aerodynamics, principles of combustion, ratios, percentages, and shop mathematics. He also should be able to read graphs and curves.

Doolittle stressed the fact that, when you have a machine that releases 30,000 shaft horsepower to its turbines, as does a 10,000 lb. thrust engine such as the J57, it must be handled intelligently.

P&WA believes that the JT3 will probably start its commercial service with a 600 hour overhaul life. This will gradually grow to an overhaul life longer than most of today's piston engines, the company predicts. The engine's combustion chamber liners will not have to be changed between overhauls, and compressors may go for two overhauls.

The JT3 should give the airlines good service since it will have had four years and over 300,000 hours of military operation behind it by the time it starts flying commercially.

Westinghouse Ways

C. C. Engert of Westinghouse told the conference that his company is investing $85,000 yearly in a training program it has set up for its own service engineers.

The one month classes are limited to four engineers to assure a high degree of personalized training.

Working on the theory that "people are the best training aids you can get," Westinghouse is striving to up-grade its staff of technical representatives to help train its powerplant customers.

To date, no announced commercial jet or turboprop aircraft will use Westinghouse jet engines.

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SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

tive, D. H. Clifford, flatly contradicted P&WA's contention that piston engine mechanics need complete reorientation and retraining before they can cope with gas turbine engines.

Only TCA men to receive factory training were instructors. They were taught the Rolls-Royce Dart turboprop which powers the carrier's Vickers Viscounts. Yet, according to Clifford, "TCA never placed an engine in overhaul with less difficulty.

"If we had to do it again, we would look upon the jet engine with much less trepidation than we did the first time. We found that our aircraft engine mechanics understand the principles of jet engine operation and make the transition from piston engines to gas turbines with ease."

Probable reason for the divergent opinions held by the airline and the engine manufacturer is that TCA was speaking of the relatively small and simple Dart, while P&WA was discussing the more advanced J57.

Lockheed's Views

Capital Airlines, also Viscount operators, find that local high school physics teachers and university professors make good instructors in the fundamentals of jet engine operation.

Airline maintenance personnel will have to become more specialized on systems when they tackle the new family of gas turbine transports, according to Lockheed.

The new planes, such as the Electra, will incorporate many new concepts other than new-type powerplants. Example is the substitution of a.c for d.c electrical power. The Electra will have four 60kva alternators to supply a.c. power. What little d.c. current is needed will be provided by rectifiers.

The Electra requires a lot of electrical power to operate its freon cabin cooling system during the summer. Therefore, Lockheed decided to use electricity to heat the cabin in the winter instead of resorting to combustion heaters which, the company believes, are not too reliable over 40,000 ft. Nor did LAC want to pipe hot compressor air in from the engines because it is too inefficient and drafty. So the plane will be warmed by electrically-heated radiant panels in the cabin's side walls and floor. Result, says Lockheed, will be even, no-draft heating.

To combat increasing systems complexity, the aircraft's serviceability has been greatly improved.

Service centers for hydraulic, electrical and air conditioning systems are located in the plane's belly where a man can get at them without work stands.

Wing service panels swing down and have components mounted on the panel so mechanics do not have to work in dark, crowded wing cavities.

Lockheed's airline training program on the Electra includes a 5 week course for supervisory personnel and 14 section courses for maintenance and overhaul mechanics. LAC realizes that no airline will want a mechanic to take all 14 courses. But the manufacturer expects Electra operators will arrange their personnel going to factory training in such a way that three to six groups will encompass all 14 sections.

Douglas has under way an extensive study of the new skills required to maintain new jet aircraft and how many maintenance hours per flight hour will be required for a given plane. The company is doing this study for the military. USAF is well along on this program.

United & American

United and American flight crew hiring philosophies are basically similar with one major difference. UAL hires only pilot personnel who, they believe, will become future airline captains. The budding pilot must progress from flight engineer to first officer to captain. AA also tries to hire only pilots who are captain material. But American restricts this to co-pilots. The airline now hires career flight engineers without any requirement for them to progress to the

left seat via the first officer's berth.

United and American agree that the strict screening required for such programs means that, on an average, only one applicant out of 50 passes. But the result is better caliber men and a much lower attrition rate among pilot trainees.

UAL finds career instructors more effective than part-time teachers. The airline sums up its flight training aim this way, "we want to bring a man through his training program successfully if possible . . . our training school instructors stress sincerity and human relationship with their students . . . we do not operate a 'wash-out machine'."

American says that it is constantly evaluating its flight training program and personnel to maintain peak efficiency. Example of the big job of moving a pilot from a Convair 240 to a DC-6 is that he has to learn 500 procedural steps, many of them in specific sequences.

United has long been a flight simulator user having machines for both DC-6 and Convair transports. The airline believes that the high costs of the devices can be quickly written off by reducing the number of training flights.

American does not believe that simulators have justified their purchase price up to now. The airline thinks that, with adequate procedure training on today's planes, simulators are not necessary to train flight crews.

American bases its opinion on a check of two groups of four crews each of which were trained to fly the Boeing Stratocruiser for the now defunct American Overseas Airlines. One group of four flight crews were trained on Pan American's 377 flight simulator, the other group of four were trained on a 377 procedure trainer. After a careful evaluation of the proficiency of the two groups, five veteran instructor pilots were of the unanimous opinion that there are no measureable differences between the simulator-trained group and the procedure trainer-taught group.

So American stopped buying simulator time from PanAm.

Burton Rodgers stresses the fact that they are pushing their procedure trainer as an adjunct to, rather than a substitute for, the flight simulator. Since the device costs but about one tenth the price of a simulator, airlines and the military can afford to have both. The trainer would be used to teach flight crews everything about a plane's cockpit and the management of most of its systems. The simulator would be used to train crews in aerial navigation and handling characteristics of the plane.

Among the many training aids currently being built by Burton Rodgers are four DC-6/7 procedure trainers just delivered to American and 34 T-33 units being built for the USAF.

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Corporation Pilots Receive Benefit Of USAF's Turbojet Experience

By Erwin J. Bulban

Dayton, Ohio—USAF is sharing with corporation pilots its hard-won jet experience to minimize the "hardships" of transition to turbine-powered aircraft.

WADC opened its doors at Wright-Patterson AFB, near here Feb. 7 and 8 for a jet know-how symposium for some 160 pilots, members and guests of National Business Aircraft Assn., patterned after an earlier open-house sponsored by the Air Force for the airlines (AW Oct. 29, 1956 p. 32).

Sixteen Air Force military and civilian technicians provided business pilots and operators with a broad base of jet maintenance and operating data, highlighting:

- **Need for rigid** pre-flight planning to maintain adequate fuel reserves.
- **Need for takeoff** thrust augmentation to overcome jet's relatively slower acceleration compared with propeller-driven aircraft, and requirement for a jet reverser for adequate reserve power landing and braking.
- **Understanding** of physiological problems of high-altitude jet flight including the effects of oxygen starvation, decompression, bends and gas expansion on crew and passengers.
- **Need for good** housekeeping of airport parking, taxi, runup and takeoff areas to prevent serious damage to powerplants due to ingestion of foreign objects.
- **Need for adequate** ground environment, including pavement capable of withstanding jet blast and fuel spillage, improved runway markings, new servicing vehicles of modular concept to reduce ramp traffic.
- **Need for improved** traffic control equipment and procedures to funnel jets quickly off and on airports.

Aircraft Operation

Because of the considerably higher fuel consumption of the turbojet compared to piston engine, flight planning must be very accurate, particularly on long stage flights, pilots were told. One WADC test pilot, citing the T-33A jet trainer, carrying a full fuel load of 813 gal., compared to 808 gal. in the military C-47 (DC-3), noted that the T-33 in nearly every case lands closer to its fuel margin than the piston transport, frequently with only 100 gal. of jet fuel remaining. He recommended that civil pilots get their traffic clearance before starting their engines; stay in their aircraft with external power on and radio tuned to the tower so that they can push the starter button as soon as they get the go-ahead. To cite fuel consumption, he mentioned that the 10,000-lb.-thrust-class P&W J57 burns some 1,100 lb./hr. of fuel at idle, compared to 2,800 lb./hr. at altitude at 500 kt. TAS.

USAF abandoned the tabular presentation of cruise control data some time ago for a form of charts it calls the mission profile, a composite of all of the possible level flight plans for a given type aircraft's given weight and configuration and using the best speeds for long-ranges.

Maximum Range Plotted

Charts contain a climb segment, level flight cruise speed and cruise climb flight path with fuel used and time elapsed values cross plotted. Illustrating with a T-33A profile chart, the speaker showed how the maximum range of the aircraft at 40,000 ft. could be plotted by tracing the climb path to that altitude and then fly level until the curve zero-fuel-remaining is reached, then trace back to whatever fuel reserve is desired, E.G., 113 gal., giving a 1,180-naut. mi. range and three-hour flight time. To plan a 1,000-naut.-mi. flight, run the finger from that point on the chart and go vertically; this shows that at 23,000 ft. the entire fuel load is needed, at 31,000 ft. the reserve would be 113 gal. and at 40,000 ft. it would be 183 gal.

The cruise climb technique, Air Traffic Control permitting, was pointed out as the simplest cruise control method for maximum range. The pilot simply climbs at the recommended climb schedule until he reaches initial cruise altitude, which is usually where climb rate falls off to about 500 fpm. He then levels out, sets up cruise speed and rpm. As fuel is burned, the plane becomes lighter and seeks a higher altitude on its own, resulting in a shallow climb of about 50-60 fpm. For best climb, ascent at virtually constant Mach number schedule was recommended.

Jet takeoff performance came in for considerable discussion, the engine's slow acceleration being the factor.

As a general example, it was noted that compared with standard 60F day, sea level, a typical jet engine loses about 15% thrust with an increase in temperature to 100F, while a piston engine loses about five percent power. A 5,000-ft. increase in pressure altitude results in a 50% increase in takeoff run for a jet and only about 25% for a piston engine aircraft. Checking the T-33A handbook shows that it requires 3,000 ft. takeoff distance at sea level on a 60-deg. day; more than twice as much distance—6,200 ft.—at 5,000 ft. at 100F.

To simplify its procedure, USAF adopted an "equivalent weight" concept based on the fact that increase in temperature is similar to an increase in weight. For example, for the T-33A, the pilot notes that an 18F increase intemperature has the same effect as a 1,500 lb. increase in the airplane's weight, so he simply adds this to the plane's actual weight when he works the chart. A T-33A weighing (actual) 15,100 lb. climbing from sea level to 35,000 ft. would require 960 lb. fuel and 88 naut. mi. and 16 minutes at standard day. With a temperature increase of 18F, effective weight would become 16,600 lb., climb to 35,000 ft. would take 1,100 lb. of fuel, cover 105 naut. mi. and take 20 min.

Because of importance of temperature on takeoff run, UAF pilots are now required to compute takeoff distance for each flight and enter it on the clearance sheet.

Cold weather has the opposite effect; a jet pilot noted that at 50-deg. below zero, thrust can be increased up to 25%, giving a shorter takeoff run and much faster acceleration. This thrust bonus turned out to actually be a handicap during recent cold-weather tests of the supersonic Lockheed F-104A Starfighter in Alaska. Extra power provided by low temperatures put the airplane through the gear down limit speed before the pilot could retract, a problem aggravated by the cold making the hydraulic system sluggish. This is a point jet airframe manufacturers should count on in designing gear doors, the limiting factor in gear-down limit speeds.

Water/Alcohol Injection

To counter the effects of temperature increases on jet takeoff runs, use of water/alcohol injection looks like a good bet for thrust augmentation. The turbojet is more intolerant of exceeding rated power output than piston engines, it was noted. As much as 10% more thrust can be obtained by using 105% of rated engine speed, but the shorter engine life results. Using a ratio of 27% alcohol and 73% water at a

flow of 650 lb./min., the J47 gains 1,200 lb. thrust. An all or nothing method when activated, W/A injection can be deactivated for aborted takeoff, and most important, has negligible effect on the engine and is probably the least expensive way of boosting jet engine power. More power, but also more complication at greater cost is common to the afterburner power augmentation system.

Thrust Reverse

Cleanness of the modern jet airplane necessitates some system for slowing it down in landing and the jet reverser looks like the most promising–equipment that could be modulated from full forward thrust to 50% reverse would eliminate or greatly reduce the need for other decelerating devices, pilots were told. There is presently no requirement for greater than 50% reverse thrust.

Majority opinion holds that there should be two levers for throttle and reverser control. Using this system, such a sequence is envisaged by WADC technicians: about two or three minutes before touchdown, at fairly high altitude, the pilot would place the engine throttle at maximum rpm., then switch to the reverse lever and modulate the equipment to maintain desired speed in the approach. After touchdown, the reverser is put in full reverse. On stopping the pilot would switch to the throttle lever to retard engine speed, automatically pulling the reverser out. At no time during operation would the pilot have to use both controls.

A prime advantage of the installation would be that the pilot would always have 100% engine rpm. Available for a go-around, eliminating the time lag due to the native slow acceleration of the turbojet.

Tests of an F-84F with an experimental reverser showed that the fighter's landing distance was reduced some 30% even though only approximately 20% reverse thrust was obtained.

Power Loss

Power loss of an engine has more serious effect on a jet aircraft's control characteristics than with a piston-engine airplane, one speaker noted. This, he said, was primarily due to the slipstream velocity over the wing being higher than the free stream velocity in the jet due to the higher power; when this higher speed is lost, lift is reduced and a large and rapid roll angle may occur. Also large yawing moments, greater than those produced by the rudder may be noticed, placing heavy loads on the aft fuselage and vertical tail.

Extra structure that would be needed to protect these areas from excessive side loads may be avoided, if the pilot refrains from corrective action until after the initial oscillation has been completed.

Increased altitude has resulted in decreased damping and increased period of oscillation in all three axes, factors that could result in making passengers uncomfortable.

Physiological problems of flight at high altitudes will take on new importance as the corporate pilot moves into the jet era and misunderstanding of their importance can be disastrous, a specialist from WADC's aero-medical laboratory stated.

Four Main Phases

Breaking his discussion into four main phases, the specialist covered:

• **Hypoxia (oxygen starvation),** giving data compiled from USAF personnel who removed their oxygen masks while in an altitude chamber. Noting that the subjects were at rest and noting that the work of flying and anxiety can increase oxygen consumption by 2.5, he gave these results of the test:

0-5,000 ft.–Normal behavior.

5,000-8,000 ft.–Undetectable behavior change to 30 min. exposure.

8,000-11,000 ft.–Detectable behavior changes after one hour.

11,000-20,000 ft.–Considerable handicap after 15 min. exposure.

20,000-25,000 ft.–Serious handicap (3-10 mm.) incapable of self preservation.

25,000-30,00 ft.–Imminent collapse in three minutes or less.

30,000-40,000 ft.–Imminent collapse in one minute or less.

• **Decompression**–The medical specialist recommended that cabin pressure be carried at 5,000 ft. equivalent in light of his belief that corporate aircraft will mainly be carrying passengers who are older than USAF jet personnel and who are in varying degrees of health, therefore more susceptible to hypoxia, bends, gas expansion in the organs and the effects of decompression.

Noting that Civil Aeronautics Administration reports some 50 decompressions quarterly in piston-engine airline aircraft, he considered the possibility of pressure and oxygen loss a real one requiring careful consideration by designers and operators of business aircraft.

Explosive decompression is the emptying of lungs in less than the emptying time of the lungs, which is a half-second or less; rapid decompression involves emptying in a half-second or longer. Time of useful consciousness after rapid decompression at 22,000 ft. is about 10 min.; at 25,000 ft., three minutes; 30,000 ft., one minute or less;

German Air Force Gets Executive Heron

Wearing the revitalized German Air Force (Luftwaffe) insignia is this DH Heron eight-passenger executive plane to be used for service communications and as a personal transport for Gen. Kammhuber, Luftwaffe chief of staff. A second Heron will be delivered to the Luftwaffe later this year. Powered by four DH Gipsy Queen 30 Mk. 2 engines, the Heron grosses 13,500 lb. and cruises at 183 mph. at 8,000 ft.

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Few structural alterations. Installation of ELANDS in the Convair 340 has meant remarkably few modifications—and these have taken place ahead of the main engine bulkhead frame, which has otherwise been retained unaltered from the original installation. Other alterations have been confined to the instrument panel, the control quadrant, and the aircraft electrical system (adapted to include a circuit for Napier 'Spraymat' electrical de-icing of engine intake, propellers and spinners).

Three examples of successful Napier Eland conversions: the Convair 340, the Elizabethan, the Varsity.

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CNC 1126

35,000 ft. and above, 10-12 sec.

Considering that man's speed of interpretation of an emergency and speed of action to correct it can be from 1.5 sec. to two or three minutes, any oxygen system but an automatic one is entirely impractical, he stated. In addition, considering the time of useful consciousness at 40,000 ft., he emphasized the importance of having at least one crew member on oxygen at all times at the higher altitudes.

Bends, caused by nitrogen in the blood stream expanding as gas bubbles, as a result of decompression, do not occur below 30,000, but age and old injuries, such as "football knee" can reduce this to 18,000 ft., he stated.

Expansion of gases in the bowels or other body cavities is another factor, particularly critical to those persons with diseased sinuses or middle age and can be very severe in those who have abdominal surgery with post-operative adhesions.

Traffic Control

Discussion of TRACALS (Traffic Control and Approach System) installation operated by Airways and Air Communication Service as a Wright-Patterson AFB facility and by WADC as a test facility included results of several return-to-base evaluations with flights of 12 B-47 jet bombers.

The crews were requested to call the Rapcon center when inbound to Wright-Patterson somewhere in the vicinity of Charleston, W. Va., about 200 mi. southeast of the base. They were asked to be about 30 sec. apart and not more than two minutes apart en route. Two controllers, with just three beacon codes on the short-range radar and two on the long-range radar were able to space the planes one-minute apart, start their power-off descents from 30,000 ft., 77 mi. from the base. After a 4,000 fpm. descent at 290 kt., the B-47s were leveled off at 2,500 ft. 10 mi. out and turned onto final approach for GCA-monitored ILS approaches maintaining their one-minute separations throughout the flight by means of small variations in headings.

Even with the limited approach control area at the base, Wright-Patterson has not had a holding stack, except for emergencies, in the past three years.

Pilots flying new types of jet fighters and bombers from the installation express the desire to remain at 40,000 ft. until cleared to land rather than be laddered down even to 20,000 ft. Feeling is that a power off descent started over 50 mi. from the field is less likely to delay other traffic arriving or departing than a normal jet penetration from 20,000 ft. using up a considerable amount of airspace and altitudes either in or adjacent to the normal traffic pattern.

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CHUCK PRICE earned a BS in 1944, MS in 1947, and a PHD in Mathematics in 1950 – all from the University of Chicago. In 1953 he joined North American's Advanced Design Department. Since then he has earned three promotions and is now a Group Leader supervising 36 engineers working on new aircraft design. His Group's objective – to select the aircraft configuration best suited to perform a specific mission.

MIT graduate **HAROLD RAIKLEN** received his BS in Mechanical Engineering in 1947 – his MS two years later. His first North American assignment was to analyze and test dynamic stability and response of powered flight controls. Today, less than four years after joining the Company, Hal heads a section devoted to design and study of mechanized components, including flight control systems – his third supervisory position.

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Better Wind Data Needed for Jet Flight

By William H. Gregory

New York—Balloon tracking to obtain upper atmospheric wind speeds is too inaccurate and too slow for jet airplane flight planning and some other method will have to be developed, F. W. Reichelderfer, chief of the U.S. Weather Bureau, told a meeting of the American Meteorological Society here.

Military jet plane operators are pressing the bureau now for improvements in method as well as quantity of upper atmospheric operations, the Weather Bureau chief said, and airline operators are beginning to ask for the same thing as commercial jet operations draw closer.

Airline Meeting

Airline meteorologists met privately with Reichelderfer during the meeting to discuss this and other problems involving weather data.

H. T. Harrison, Jr., director of weather service for United Airlines, said the airlines did not view high level wind speed data inaccuracy as critical for airline jet operations, but agreed that it was one of the problems which would have to be faced.

The military view of the situation was touched on by Lt. Cmdr. J. W. Hinkelman, Jr., a meteorologist who also is a naval aviator with jet experience. His personal view from flight experience is that the need for accurate wind speed data in the upper atmosphere is becoming a "life or death" matter for the pilot.

One frequent source of error, Hinkelman pointed out in his paper, coauthored with Herbert Riehl and Elmar Reiter of the University of Chicago Meteorology Department, is in radar tracking at low elevation angles. Small changes produced by the hunting of the radar or inertial periods of the equipment can produce large fictitious variations in wind speed, he said.

Reichelderfer said that errors had reached as high as 50% on some occasions.

These balloons also require 1½-2 hr. for ascent, which is too slow for jet operations.

"As far as jet stream soundings are concerned," he said, "we need better means than the radiosonde balloon, but there is nothing definite in line now. This is on the Buck Rogers order, but there is a break in density associated with jet streams that might be detected. It might be that radioactive isotopes could be tracked, or some other substance used as "window" which could be tracked more accurately by radar."

Development of better wind speed tracking methods probably will be left to the military, Reichelderfer said. The subject is of great importance to them and in general the services are better able to provide the funds.

The Weather Bureau hopes eventually to find mathematical means to predict behavior of the jet streams. However, the bureau is hampered now by a general need for advancement in mathematical methods, models to express better what goes on in the atmosphere, Reichelderfer said.

This need is delaying progress in numerical prediction and utilization of computers by the bureau.

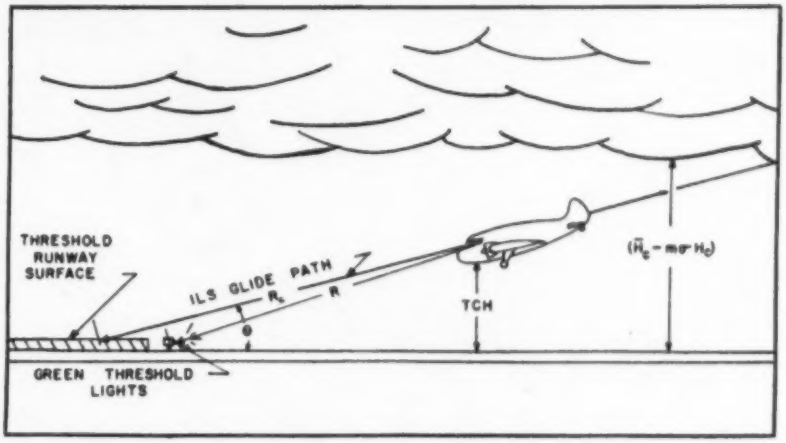
Airlines and the military also are asking for more upper atmospheric data in general, and one response to this has been an increase in daily radiosonde soundings from two to four. For 100 stations, this adds a cost of $4,000-$6,000 a day, which explains why there is reluctance on the part of the bureau to add further to the overall number of soundings.

Observation Demand

There is a demand also for additional soundings from areas not now covered. Blank spaces are most noticeable in the Rocky Mountain regions, and there is a blank over the Pacific Ocean south of the weather ship stationed between Hawaii and the Mainland. More downstream stations have been proposed as a means of combatting tracking errors in wind observations.

Though Reichelderfer saw no immediate hope of progress in obtaining better wind observations, he did feel progress had been made in another area of concern to airline operators—terminal observations. He referred to the end-of-the-runway observations made at the ANDB Newark Airport Project, which were described in detail in a paper by Charles G. Knudsen, former meteorologist in charge of the project, and William E. Eggert, acting meteorologist in charge, in a joint session with the Institute of Aeronautical Sciences.

Weather observations taken at the terminal periodically do not necessarily portray accurately the weather actually encountered by the pilot in approach and landing. Thus the purpose of the project was to try to find a better system at an airport with a large traffic volume and a high incidence of poor weather.



RELATIONSHIP between slant visibility, indicated by line R; glide path, shown by line R_c, and the threshold height (TCH) is shown in diagram.

Slant Visibility

Using a ground estimate of the slant visibility, it was concluded that it was possible to give the pilot an altitude for threshold contact height; that is, a height of the plane on the glide path at which the pilot can first be expected to see the approach lights, threshold lights, or other identifiable objects on the instrument runway.

• When put in operation, slant visibility was simply related to the glide slope angle of 2.8 deg. through a series of nomograms giving a graphical representation of formula already solved for conditions encountered at Newark. These nomograms, consisting of five plastic-coated underlays and 14 transparent overlays, were supplied by the Sperry Gyroscope Co., which participated in a predecessor project at MacArthur Field, Islip, N. Y.

Instead of reporting a slant visibility of 10,000 ft., the pilot was told his threshold contact height was 560 ft. Parameters for determining slant visibility, and how they are obtained:

• **Horizontal visibility**, measured by a

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transmissiometer near the touch down point of the runway.

- **Cloud height,** measured by a rotating beam ceilometer near the ILS middle marker.
- **Terrain illumination** and brightness of the horizon sky in the direction in which the pilot is looking, measured by photometric equipment.
- **Reflectance values** of the runway surface, runway markings and surrounding ground, measured during dry, wet and snow conditions.

As soon as the threshold contact heights were determined, they were transmitted to the tower via direct wire to a digital readout unit. In turn, these values were transmitted to the approaching aircraft when aircraft was reported inbound from outer marker.

Pilot Help

Cooperation of pilots was asked in reporting "green lights," the moment they first saw the green threshold lights. To check the accuracy of the height, the tower operator triggered two modified Beattie Veritron cameras which photographed the plane's echo on the three and ten mile elevations and azimuth scopes at the instant the pilot reported. Threshold heights then were recomputed with recorded data for comparison.

Because of lack of familiarity on the part of pilots, only 979 reports were received of green threshold lights or runway surface through last June, when project was to have ended. Reports available were broken down into five categories, distinguishing day and night, and between positive reports of "green lights" and of "lights" which may have referred to white bar or flashing approach lights.

Nebulous Results

Correlation coefficients were best for night landings.

The project, as extended, will continue at least through December. Preliminary results presented in the paper gave a nebulous picture, but Knudsen said later figures through November of last year—now being analyzed by Sperry engineers—showed real promise. The Weather Bureau is convinced the approach to the problem is the right one.

One boon to the program was assurance from the CAA to pilots that they would not face legal action for placing themselves on record in their approaches.

What lies ahead is a further refinement of the constants used in the calculations, and a development of techniques to forecast threshold contact height. Knudsen believes this is possible; though the forecasts will have to be 90-95% right, their required duration of only 30 min. or an hour will be a compensation.

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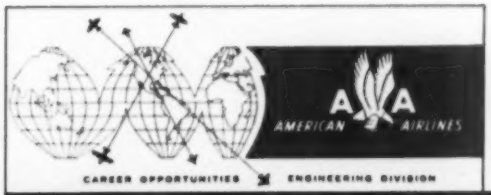

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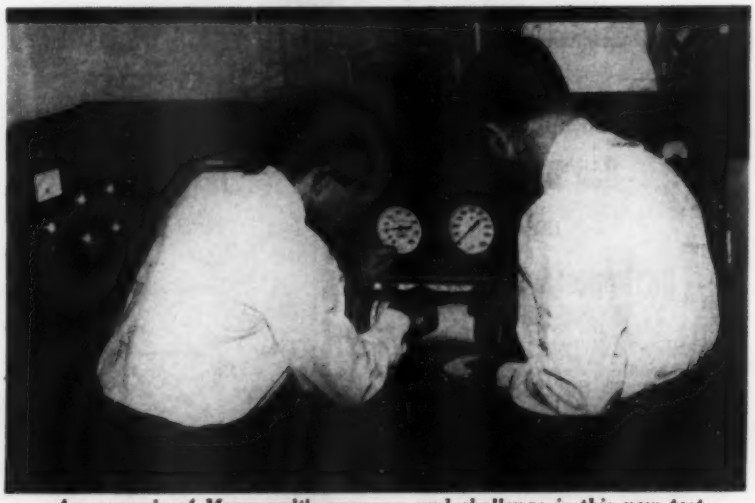

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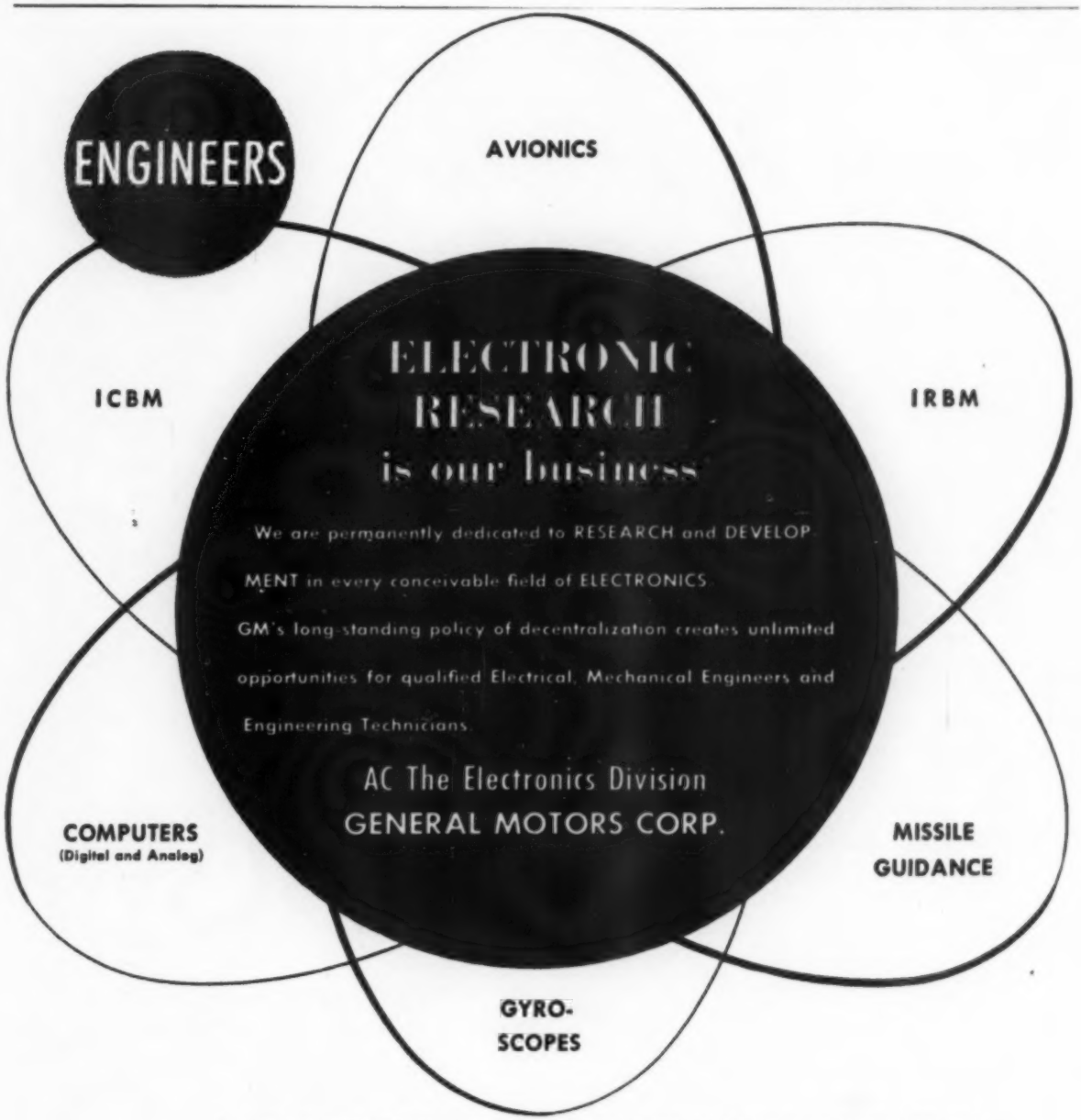
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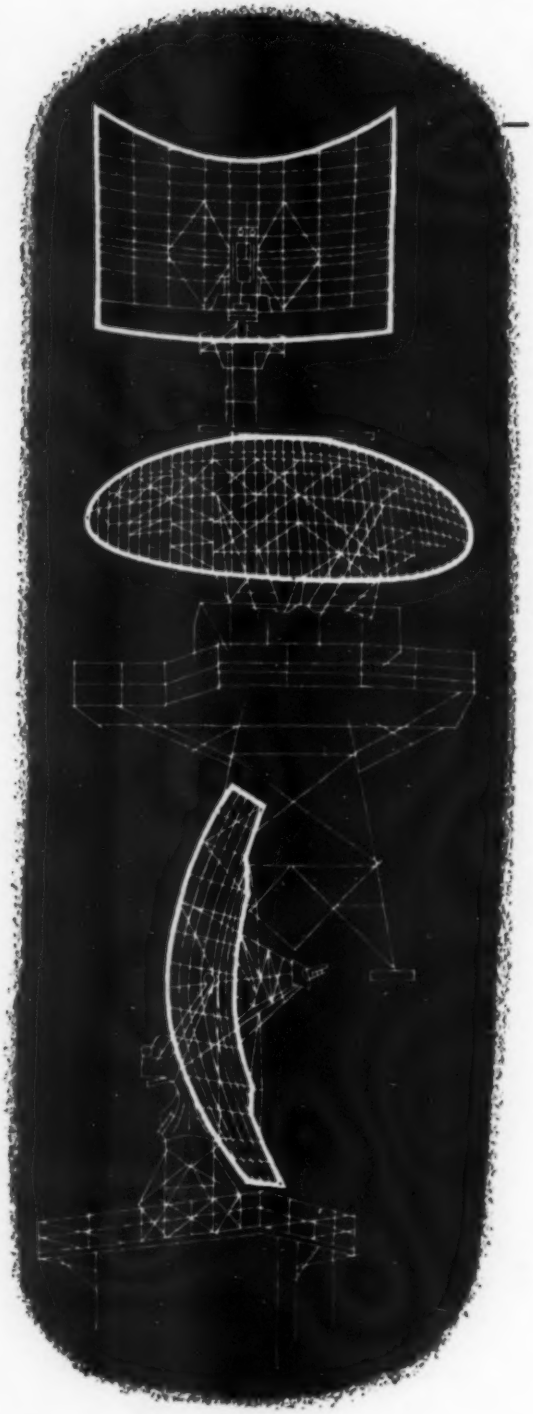

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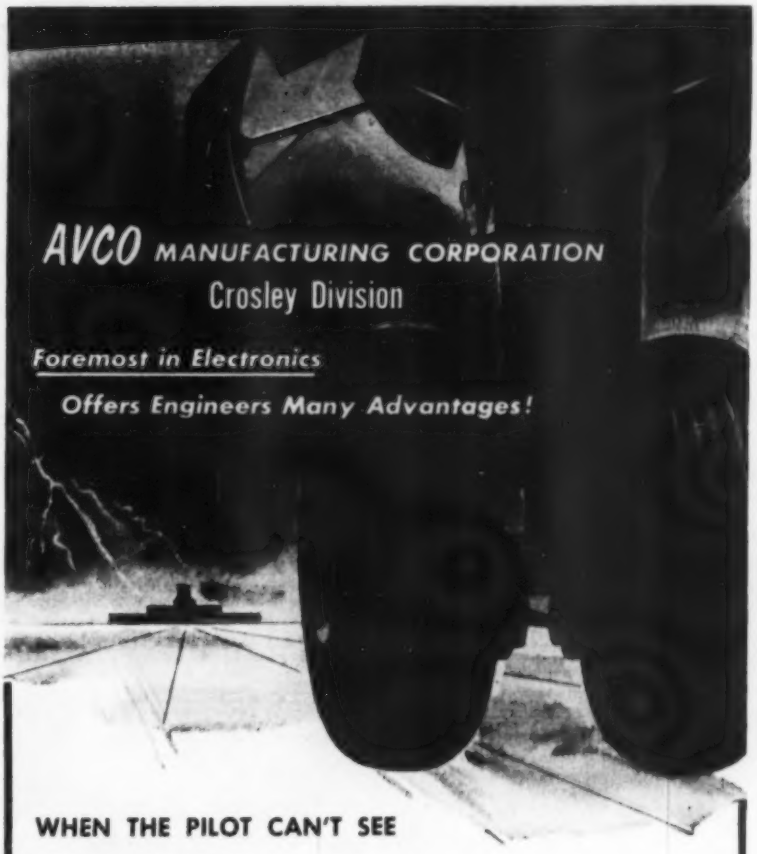

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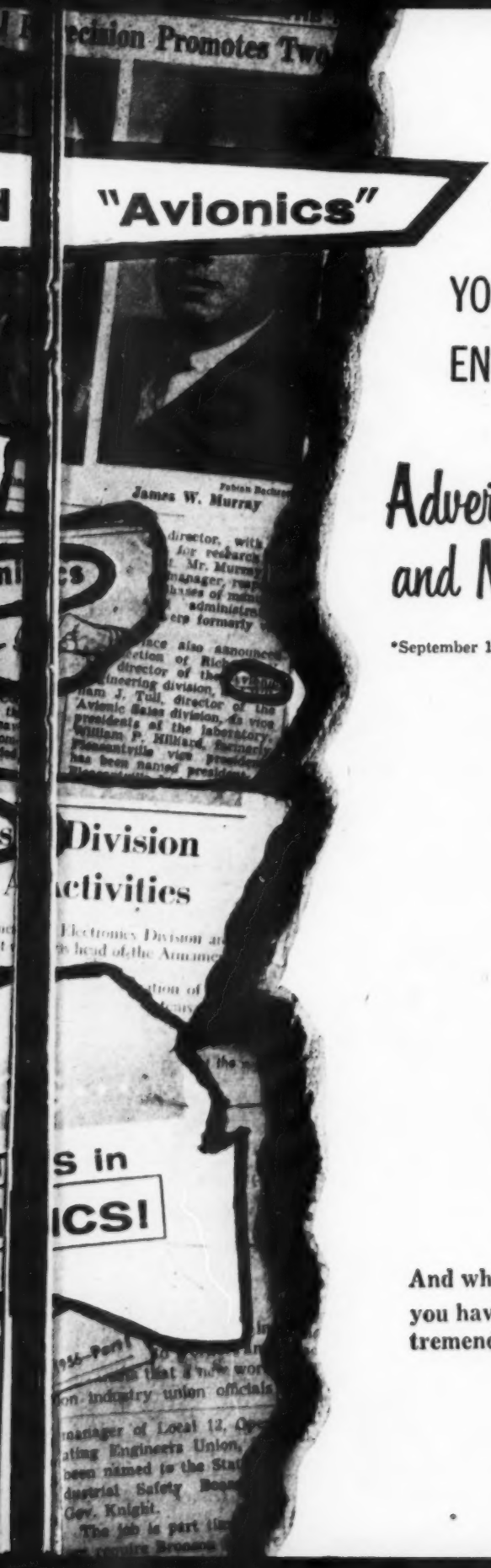

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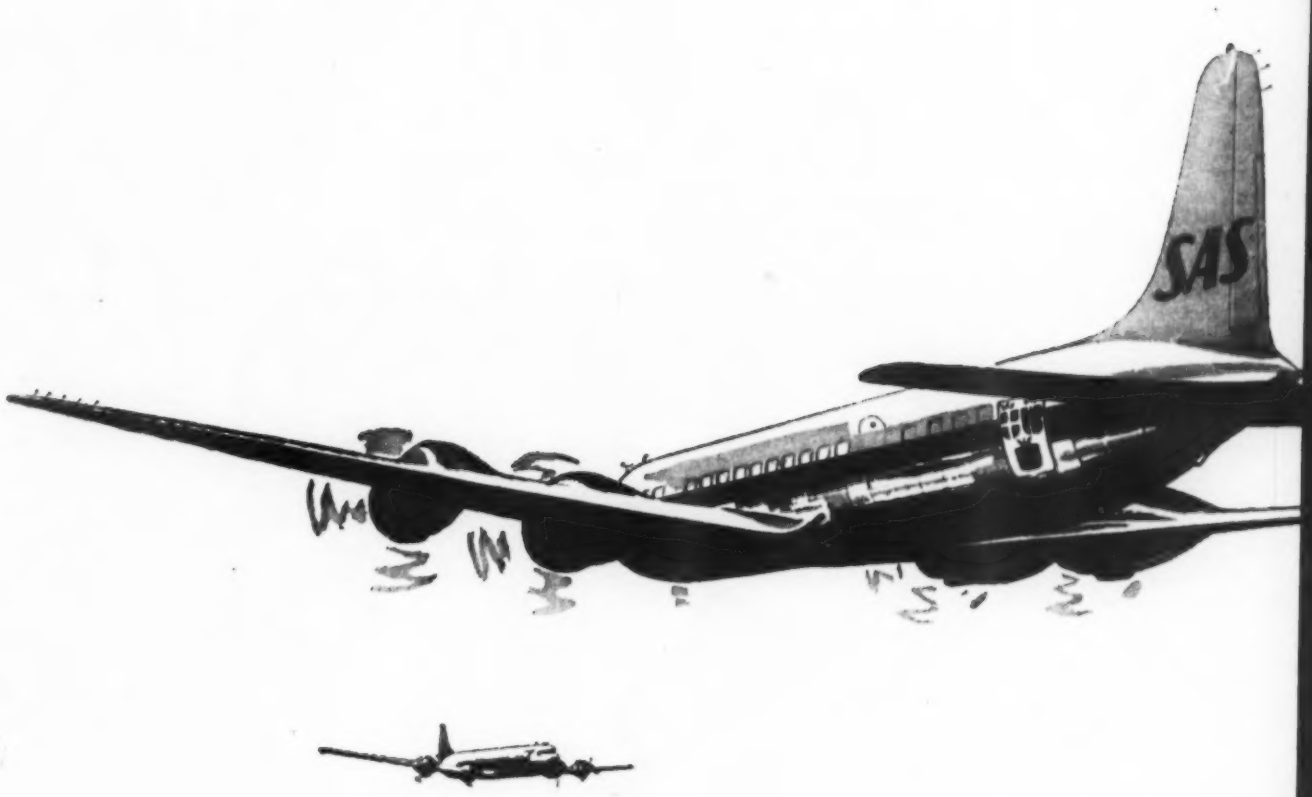

POLAR RENDEZVOUS

And Collins is there. The SAS DC-7C's scheduled to rendezvous over the precise geographical North Pole, on their February 24th inaugural flights linking Tokyo and Copenhagen, fly with Collins communication and navigation equipment. We congratulate SAS on a significant commercial aviation first and take pride in our long association with this pioneering airline.

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LETTERS

Cooperation

The "Cockpit Viewpoint" expressed in AVIATION WEEK (Jan. 28, 1957) is praise well deserved in our maturing industry, and recognizes the expanding scope of cooperation between manufacturers, airline managements and airline pilots.

Inadvertently omitted was the Convair Division of General Dynamics, which has extended full cooperation to the ALPA. Mr. Bernie Simons, Project Engineer for the Convair 880, has been genuinely interested in the Air Line Pilots' viewpoints and suggestions, and our committee feels a better airplane will evolve through this "collective idea" approach.

A logical approach is apparent in this "Spirit of '56," and is welcomed by the pilots who must ultimately live with airplanes being engineered today.

ROBERT F. ADICKES, CHAIRMAN
ALPA Convair 880 Evaluation Committee
Coral Gables, Fla.

Antique Policies

It might do well for many company managers to look into and try to use some of the techniques on an administrative level that engineers utilize for solving technical problems. I don't believe management is fully aware that antique personnel policies towards engineers and scientists are only making their position more lofty and vital. . . .

The combined effect of rapid technological advances requiring more and more engineers and scientists, coupled with the antique attitude of "get as much out of them as possible for as little in return," attempts a solution to an immediate problem with future ramifications magnifying the problem ever more, like the rat chasing his tail.

. . . In engineering, the principle of Systems Analysis is utilized. This device considers the system as a whole and how individual components of the system affect the function of other components and the system as a whole. As applied to the realm of business administration, I can make my point by illustrating, when the principle is not used, what happens, in this case, to the "poor" engineer and scientist as a result of narrow thinking on the part of management.

The eagerness of many companies to offer high starting salaries to engineering graduates can only serve to shorten the salary gap between us "old experienced" men and the graduate.

As a consequence, management is forced reluctantly to separate the gap to keep peace and keep as much of the present engineering staff intact.

The campaign to increase the number of high school students to consider science and engineering as a career will not amount to much.

The reason is obvious if one considers the human element. Only a "square" would take math and science in high school and the associated homework. Unlike other courses, math and science are subjects that require an understanding that is generally acquired by intense work that solves problems by reasoning and not memory. A normal teenager would naturally shy away from "work." He or she is a fun loving and fun seeking person and would rather spend the time after the school day down at the local drive-in.

No wonder there is a shocking lack of interest in math and science today in the schools.

The same applies to the selection of a career in the college domain. Why select an engineering career with all the work required to get the sheepskin and then find out five years of experience brings a poor salary compensation. A course in business administration is the exact opposite of engineering.

Who should know best but company executives.

Last but not least, some company managers continue to believe the art of engineering of ten years ago is still applicable now. The philosophy of "if the part breaks, beef it up so it doesn't break" is obsolete. Tell that to an electron in an unstable servo system. Sales and reliability of a company's product will be a reflection of the company's engineering department. Even a good salesman can't sell poorly engineered items.

The economic status of the engineer and scientist can not but continue to improve through no effort of his own. It can happen as a result of management indifference as is now occurring per above or by enlightened policies in consideration of the system as a whole within the domain of their company.

MURRAY OGMAN
Los Angeles, Calif.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Sic Transit Gloria

"Keep America Ahead" says one of your display ads in a recent issue. Why doesn't someone tell 'em that Great Britain (a) holds the world's air-speed record, (b) holds the world's altitude record, (c) holds the world's land speed record, (d) holds the world's water-speed record, (e) invented the gas turbine engine (and still leads in its design), (f) invented the thermionic valve (which made radio possible), (g) invented radar, (h) invented television, (j) invented hundreds of other familiar things such as the bicycle, the postage stamp, and the railroad, to say nothing of splitting the atom!

It seems to me that one side of American education is sadly neglected and has not changed since that time during the war when I was friendly with some U. S. airmen who had crossed by the Queen Mary and were very proud of this fine American ship. In spite of her name, they remained unconvinced that it was British.

Their argument was that because it was the largest and fastest liner afloat, it must be American.

How many people in America know that British passenger aircraft are flying on U. S. domestic airlines and that British designed airplanes are in service with the U. S. Air Force.

How far ahead are you?

F. A. WILKINSON
"Wold View," North Cave
Brough, East Yorkshire
England

Semantic Point

I thoroughly enjoyed Mr. Max Pape's article concerning engineer recruitment in AVIATION WEEK, Jan. 21, p. 97, but would like verification on one of his items.

Mr. Pape wrote, "We (engineers) prefer to work for companies with engineers in administrative positions because we feel that with engineers in charge there is less chance of waste of engineering talent." Such an obvious contradiction can not go unchallenged.

What Mr. Pape possibly meant was: We prefer to work for companies with engineers in administrative positions because there's a better chance of more engineers getting these positions.

RICHARD E. PARROTTE
Parks College of Aeronautical Technology
East St. Louis, Illinois

Demand vs. Salary

At last! Congratulations on cutting through the fog created by the persistent claims of shortage of engineers by providing some "test data" on the subject ("Ads Entice, Replies Rebuff, Survey Finds" AW Jan. 21 issue).

Now, if someone would just plot curves of Demand vs. Salary and Demand vs. Years of Engineering Experience, the shortage hoax would be exposed in its entirety.

May I have permission to reprint this article in our publication, the Northwest Professional Engineer?

DAN N. HENDRICKS, JR., PRESIDENT
Seattle Professional Engineering Employes Association
Seattle, Wash.

Wrong Helicopter

Oh! that is a mighty large S-55 in your photographs on pages 37 and 38 of the Jan. 28 issue.

S. E. EMMONS, JR.
Pan-Maryland Airways, Inc.
Friendship International Airport, Md.

(Reader Emmon's detected what AVIATION WEEK *desk editors missed. The pictures are of a Sikorsky S-58 not the smaller S-55. Course in helicopter recognition is being conducted for ex-fixed wing pilots now functioning as desk men.—Ed.)*

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HOW FAR IS

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This is an excellent [illegible] mechanisms [illegible] acquired [illegible] and re[illegible]

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